SIXTY-EIGHTH YEAR

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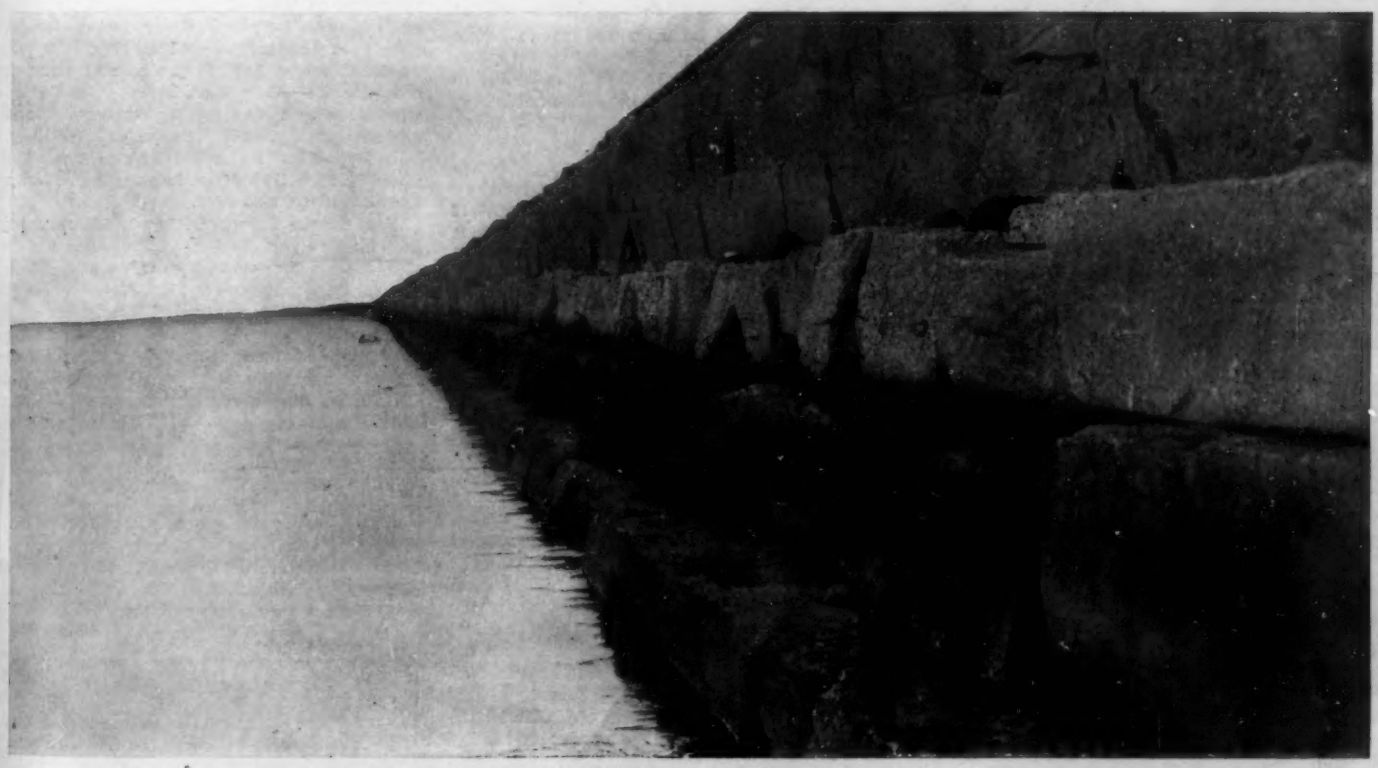
The sum of $2,900,000 was spent in constructing 9,250 feet of the Los Angeles breakwater. The mass of stone used weighs 2,426,337 tons. The breakwater creates an outer harbor of refuge, 375 acres in extent.



The Los Angeles breakwater from the harbor side. The wall is 11,150 feet long, 122 to 194 feet wide on ocean floor, 38 feet wide at low water level, 20 feet wide on top, 14 feet above high water. The individual stones weigh from 100 pounds to 20 tons each.

THE HARBORS OF THE PACIFIC COAST.—[See page 160.]

SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Railway Speed and Safety

THE Public Service Commission, after investigating the recent wreck of the Twentieth Century Limited, found that the accident was due to the breaking of a rail, and that, though the rail was a fairly good one, it was not equal to the strain to which it was subjected under the high speed of this famous train. According to the report, the fastest express trains are running on "schedules too fast for safety;" and the commission recommends that the speed should be reduced with a view to easing up the burden which is now imposed upon the tracks. In other words, instead of bringing the rails up to the speed, it is suggested that the speed be brought down to the rails.

Now, this means that the rail manufacturers are to be put in control of the whole situation; they are to manufacture the kind of rail which suits their particular whim, and then the speed is to be adjusted to whatever kind of product they care to turn out. Put in plain words, that is the exact situation; and if ever there was a case of deliberate retrogression, it is to be found in this proposal to reduce speed. We are not for a moment disputing the broad wisdom of the suggestion made by the commission. On the contrary, we believe that the commission is correct in its statement that the present speeds are too high for the kind of rails over which it is being made. Until an absolutely reliable rail is produced, it would certainly be desirable to ease up on the heavy strain to which the present rails are exposed, when the enormous engines which haul our fastest trains run at speeds of from sixty to eighty miles an hour.

In the choice between high speed and good rails, however, it is assuming too much to suppose that it is impossible to produce a rail which will stand up under heavy, high-speed traffic. On the contrary, it is well understood by engineers that it is possible to produce such rails, and that the failure to secure them is entirely due to the rail makers. More than once, the SCIENTIFIC AMERICAN has gone deeply into this question, and we have shown that the deterioration in steel rails is due entirely to the reluctance of the rail mills to discard a sufficient percentage of the steel ingot, and to put into the rolling of the rail in the mills that time, care and patience, which are necessary to secure an absolutely reliable product. When the steel has been cast into an ingot, preparatory to rolling it down into rails, a large percentage of the steel is defective. Conscientious manufacture demands that the whole of this defective portion be cut away, and only the sound portion be sent on for heating and rolling. The engineers of the railroads, anxious to secure rails free from "pipes" (hidden, incipient fractures on the rails) demand a large percentage of "discard" as it is called, asking sometimes for as much as twenty-five per cent; but the manufacturers, aiming at economy of time and labor, a cheap product, and large output, have always contested this demand of the engineers, and have made the discards just as small as they possibly dare to do.

So powerful has been the influence of the manufacturers, many of whom are directly interested in, and more or less control, the railroads, that they have continued to send out an inferior rail, and the result has been shown in the large number of accidents in the past few years, that are attributable to rails which have broken because of incipient pipes or fractures, hidden within the rails.

The Public Service Commission is in favor of high speed under proper conditions; but it begins to look as though it realizes how all-powerful is the influence of the manufacturers, and, therefore, despairing of a sufficiently good rail, the commission has taken the only course open to secure safe travel, and has recommended that speed be reduced.

But high speed, under proper conditions, is one of the ear-marks of progress; and it is too early in the day to acknowledge defeat and accept whatever the manufacturers are pleased to offer. A redesigning of the rail section, a better distribution of the metal in the various parts of the rail—head, web or base—a twenty to twenty-five per cent discard of the ingot, and a showing down of the rail mills to a speed which would insure a high quality in the steel, would give to the country a rail over which fast trains could run at high speed, without danger of derailment.

First Fruits of the "Titanic" Disaster

THE White Star Company, is to be commended for the promptitude with which it is putting into practice the lessons taught by the "Titanic" disaster. According to cable dispatches, the company is making radical changes in the underwater construction of its two largest vessels, the "Gigantic" and the "Olympic." The extensive and costly nature of this work may be judged from the fact that the total expense is given as approximately a million and a half dollars. The outlay is large; but we believe that it will be more than compensated by the increased confidence of the public—a confidence which was rudely shaken by the sudden loss of the latest and finest of the ships that fly the White Star flag. For the past fifty years the White Star ships have been regarded (and very justly so) as among the most substantially constructed and best officered of the trans-Atlantic liners. The recent disaster was chargeable more to the system under which modern ships have been built and operated than to any particular delinquency on the part of the company, whose vessel happened by the laws of chance to be the one selected to demonstrate how faulty that system was.

Therefore, the prompt action of this famous line in taking steps to render its ships proof against such an accident as befell the "Titanic," is certain to restore confidence in the White Star Line and lead the way in a return to those principles of safe construction from which the art of shipbuilding had so widely departed.

The changes in the "Gigantic," a slightly larger vessel than the "Titanic," were foreshadowed by Mr. Ismay in his testimony before the Senate Investigating Committee. The "Gigantic" is now under construction at the Belfast yards, and the improvements will consist in extending the inner plating of the double bottom up the sides of the ship, to a point well above the deep-load water line. We are not in possession of the details; but in all probability this plating will be riveted upon the inner flanges of the heavy web frames, nearly three feet in depth, which extend throughout the greater part of the ship's length. In his testimony before the Lord Mersey investigation in London, Mr. Wilding, the chief naval architect of Messrs. Harland & Wolff, stated that there was an objection against such an inner skin, on the ground that it would be difficult to inspect the inner surfaces of the plating, and serious rusting might occur. The objection would be valid if the space between the skins were too narrow to admit a force of painters. But a width of three feet would give the necessary clearance, and it would be quite possible to provide manholes, of suitable size, through which a gang of men could enter to inspect and repaint the interior surfaces.

The changes to be made in the "Olympic" will be even more extensive and costly. They will involve an entire reconstruction of the boiler rooms. The present transverse bunkers will be removed, and new coal bunkers will be built along the sides of the vessel, the construction being similar to that of the "Mauretania" and other ships of her class. This will involve an entire re-arrangement of the boilers, which at present are placed five abreast, each battery extending entirely across the ship. Probably the boilers will now be placed three abreast, which would leave sufficient room for longitudinal coal bunkers. The inner walls of the bunkers will form practically an inner skin to the ship, and any rupture of the outer skin would involve the flooding of merely the relatively small bunker compartments in the neighborhood of the injury.

The fact that this work has been undertaken by the White Star Company in advance of any legislation making it mandatory, is very significant; and it cannot fail to exert a powerful influence in hastening the forthcoming reforms in the construction of passenger ships. If the changes in the "Olympic" and the "Gigantic" are to be made in association with a watertight steel deck, at or near the water line, it is not too much to say that the fine vessels will be practically unsinkable by any conceivable disaster of the sea.

The Unfortunate Bureau of Chemistry

IF any one who is at all familiar with the wretched organization of the Bureau of Chemistry and its unscientific methods cherished the illusion that a new and brighter era was to dawn with the appointment of an energetic, competent man to fill Dr. Wiley's place, and that the investigations of the bureau were henceforth to be so conducted that it would be unnecessary to maintain at great expense a Referee Board to check up the work of the Bureau, he is doomed to disappointment.

The Pure Food and Drugs Act, as fine a piece of legislation as Congress ever enacted, is destined to remain ineffective because the head of the Bureau of Chemistry is either unable or unwilling to gather scientific evidence of frauds and to present that evidence in legal form. It is highly probable that the real scientists in the bureau, the men who have conscientiously endeavored by rigorously conducted experiments to ascertain the actual and not the supposed effects of drugs and preservatives in foods and beverages, will resign, leaving behind them a heterogenous collection of alleged analysts and of pseudo-chemists. Not until incompetent officials now in positions of authority have been relegated to places which they are really able to fill, and are prevented from further interfering with the effective administration of the Pure Food and Drugs Act will the Bureau of Chemistry be in a fair way of redeeming its shattered scientific reputation. It is astonishing to us that the press throughout the country has failed to realize how farcical it is to have a Bureau of Chemistry and a Referee Board engaged in exactly the same work, the one vehemently proclaiming its guardianship of the public stomach, the other critically examining the facts by the rigorous methods of scientific reasoning and experiment. In no other branch of the Government service, certainly in no branch in which scientific work is conducted, is this anomaly to be found. The Bureau of Chemistry has the unenviable distinction of requiring supervision from an extraneous body of experts. Like the sophomore class at college, it needs the correction of a faculty; and, as might be expected, conducts itself in a sophomoric way.

The situation must be intolerable to every man of real scientific instincts. Men who have conscientiously endeavored to ascertain whether or not certain ingredients in foods and drugs sold to the public are harmful or not, and who have been bold enough to voice their convictions in reports recommending that manufacturers be permitted to use these ingredients because of their harmless effect, have been treated as rascals. Men with little or no laboratory experience, who have prepared what may be called cooked-up evidence of fraud and toxicity have been praised and advanced, even though the courts have ultimately decided against them.

The daily press has hailed with enthusiasm the appointment as head of the Bureau of Chemistry of a man whose past career holds out no promise for future reform in the methods of administering the Pure Food and Drugs Act. A graduate of an agricultural college in the Middle West, he has never published any scientific work of importance; nor has he pursued any graduate studies. The relation of physiology to the Pure Food Law is a sealed book to him. Far better would it have been if an intelligent civilian with an open mind were appointed.

Alas, for the Pure Food Law! Manufacturers who have money enough to fight in the courts and to engage experts at high market prices will continue to toy with it, and the poor public will continue to alleviate the pains of indigestion, contracted because of the Bureau's ineptitude, with medicines whose sale the Bureau ought to prevent. If "muck-raking" were still journalistically fashionable what a sensation the exposure of the conditions in the Bureau of Chemistry would create!

The International Institute of Agriculture.—M. Louis Dop, the French delegate to the International Institute of Agriculture in Rome, and vice-president of the Institute, has published a pamphlet reviewing the history of this remarkable body, and predicting the lines of its future development. Fifty countries now adhere to the convention of 1905, and contribute a total of $100,000 a year to the maintenance of the Institute; while the King of Italy, from his private means, contributes $60,000, and has given the Institute a splendid building in Rome. Besides the world-wide crop-reporting service—which has been the dominant feature of the enterprise from the beginning—many other lines of work are carried out on a vast scale. Probably one of the most important is the collection and abstracting of agricultural literature from every corner of the world. The voluminous publications issued by the Institute during the last two or three years include, besides its polyglot periodicals, many exhaustive reports on special subjects, e. g., the crop-reporting systems of the different countries, the organization of agricultural meteorology, statistics of hail insurance, etc., etc.

Electricity

Tungsten Street Lamps in Chicago.—Chicago has decided to substitute 80-watt Tungsten lamps for the gas street lamps it now uses. The gas lamp posts are being remodeled to receive the electric lamp. Over five thousand Tungsten lamps are to be installed.

An Automatic Waiter.—An Australian has invented an electric waiter for hotels and restaurants, operated by the customer seated at his table. A wooden frame holding the menu card is fitted with push buttons opposite each item, and "pressing the button" rings a bell in the kitchen and displays the order and the table number. The kitchen apparatus also prints a check the original of which comes to the customer, with a duplicate on an endless tape. This device has been in successful use in New Zealand.

Vacuum Cleaning Extraordinary.—A machine combining two modern inventions, the electric car and the vacuum cleaning apparatus, has been applied in Strassburg to clean the tramway tracks of that city. In the operation of the machine the roadbed is sprayed with water, then the dirt is loosened by a scratcher and drawn up into the car by the suction apparatus. With this machine one man can clean 25 miles of track a day, replacing the labor of 17 men working in the ordinary way.

Electrical Transmission of Small Water Powers.—The present day is one of very large hydro-electric transmission schemes, but in France small water powers have been successfully utilized. A typical rural hydro-electric scheme is that of Cotentin, on the banks of the river Saire. In this installation the energy in the fall, only 15 to 20 horse-power, is transmitted over a maximum distance of 4½ miles. During the day the output of the generating plant is utilized to run dairy machinery, and at night the current is switched on to lighting circuits.

Flashing Sign for Autotruck.—The large number of electrically propelled trucks now in use has suggested the idea of equipping these trucks with electric flashing signs. This has been tried out and has proved very effective. An automatic flasher is used which will change the color of the sign with each flash. The name or trade-mark is outlined with electric lamps and the sign is flashed out at frequent intervals in red, pink, white and green lights. The effect is very pleasing making the advertisement correspondingly valuable.

Improved Method of Lifting Pig Iron with a Magnet.—It is quite a common practice to use lifting magnets for handling furnace pig iron. Usually the pigs are stacked horizontally and not many of them can be lifted at a time because a relatively small number can be brought into contact with the magnet. Someone has recently hit upon the idea of stacking the pigs vertically, so that the face of the magnet will touch a greater number of pigs. It has been found that by this method, the lifting capacity of a magnet which heretofore was able to raise only 1,000 pounds of pig iron was increased to 2,000 pounds.

Reflecting Power of Wall Papers.—The surface brightness of walls or ceilings lighted by daylight or artificial light is now determined directly by an improved portable apparatus for measuring illumination and known as the "holophane lumeter." Tests of various wall papers in rooms lit by tungsten lamps showed that a surface brightness of 0.3 foot-candles is usually necessary to give the room a cheerful appearance. Light blue, dark red, deep green, and very deep blue wall papers showed surface brightness varying from 0.3 foot-candles for the first mentioned to 0.05 foot-candles for the last mentioned, with corresponding reflecting powers varying from 40 per cent to 4.5 per cent.

Shorthaul Electric Truck Service.—An excellent illustration of the value of the electric truck for short haul is cited by the *Electrical Review and Western Electrician.* In a certain large mill a boiler plant is located about a hundred yards from the coal storage yard. The fuel used to be handled by wheelbarrows, but an electric truck salesman learning of this work, made an investigation of its cost and came to the conclusion it could be done more economically by the use of a motor-driven truck. A storage battery truck was purchased and it soon proved its economy. A single man was required to operate the truck, his work including the loading as well as the discharge of the truck.

Hand-driven Generator for Wireless Telegraphy.—The United States Signal Corps has developed a new form of generator for use with its portable wireless telegraph sets. It consists of a small generator, the rotor of which is driven by hand cranks through a suitable gearing. Two cranks are provided, so that two men may drive the motor at the same time, and if necessary four men may be employed—two at each handle. A low and high speed release is provided, which disengage the driving gear when the speed rises above or falls below a predetermined limit, so that the rotor may be kept at a fairly constant speed. The generator is capable of turning out about 200 watts, and it is light enough to be packed on a mule. The portable generating set has a sending capacity of about fifteen miles.

Science

Cape Deshnef.—The extreme northeastern corner of Asia is still called "East Cape" in many atlases and other geographical works. The *Bulletin* of the American Geographical Society calls attention to the fact that the name of this point was changed to "Cape Deshnef" in 1898 by command of the Emperor of Russia, in honor of the explorer who discovered it.

Surveying with the Camera.—The first extensive use of the panoramic camera to supplement the plane-table in surveying is said to have been that made by Mr. J. W. Bagley, of the U. S. Geological Survey, in mapping an area of 160 square miles around Valdez, Alaska, during the season of 1911. This method promises to become a regular feature of the Survey's work in Alaska.

The Twelfth International Congress of Geologists met at Toronto, Canada this week. Among the special subjects for discussion were the world's coal supply, and interglacial periods. Twelve excursions of from one to twelve days took place before the meeting, and ten of from four to twenty-three days after it; some of the latter extending to the Pacific Ocean and the Klondike.

Fixing Atmospheric Nitrogen in Iceland.—Thorlakhavn, the best natural harbor on the south coast of Iceland, has been acquired by a French company, along with neighboring waterfalls yielding about 200,000 horse-power, and a plant will be erected at this place for manufacturing artificial saltpeter by the utilization of atmospheric nitrogen, according to the Birkeland-Eyde process.

Numbering Street Car Lines.—The names of street car lines are usually a source of perplexity to new arrivals in a city, and the confusion is often increased rather than mitigated by the signs on the cars. A consular report from Amsterdam tells us that in that city the convenient plan has been adopted of giving each car line a number. This number is suspended between the arms of the trolley pole on each car and is visible several hundred yards away. The numbers are always referred to in directing inquirers. Most German cities have a similar system, which works very successfully.

A Rhine Museum is soon to be founded at Koblenz, if present plans are carried out. It will include a large collection of charts, pictures, models and diagrams illustrating the physical conditions, past and present, of the famous river, and a complete exposition of its economic history. Some of the unique features will be: Models of the various types of vessel used on the Rhine from early times to the present; models of past and present bridges; illustrations of the methods and apparatus used in maintaining and improving the navigability of the river. A fine series of geological models is contemplated. The city of Koblenz has already given a site for the building.

Spitzbergen as a Scientific Preserve.—Diplomatic negotiations regarding Spitzbergen, now in progress, contemplate the unique plan of setting aside this far northern archipelago as a sort of happy hunting ground for scientific men. According to this plan, no land can hereafter be acquired in Spitzbergen except for purely scientific or humanitarian purposes, and the further exploitation of land already in the possession of commercial organizations (mines, fisheries, etc.) will be placed under such restrictions as will ensure the preservation of the flora and fauna. The hunting of fox, polar bear, walrus and reindeer will be prohibited from May 1st to September 15th. The hunting of eider-duck will be prohibited entirely, as also the use of poisons and explosives in fishing.

The Pittsburgh Smoke Investigation.—The Department of Industrial Research at the University of Pittsburgh has published the first of a series of bulletins on the investigation of the "smoke nuisance," for which funds were provided on a munificent scale by a Pittsburgh business man. The investigation is being carried on by a staff of twenty-five specialists, six of whom give their entire time to the work, while the others have been intrusted with the preparation of reports on special phases of the subject. The topics discussed briefly in the initial bulletin are: Smoke and the Weather; How is Vegetation Affected by Smoke and Soot; The Chemistry of Smoke and Soot; The Physical Problems of Smoke; Deterioration of Buildings and Building Materials; Smoke and Disease; What the Smoke Nuisance Costs; Who Makes the Smoke; Laws and Ordinances Concerning Smoke; General Experimental Work; Smoke Means Waste and Inefficiency; The Education of the Public; The Question of Legal Regulation. It is stated that the smoke nuisance costs Cleveland $6,000,000, Cincinnati $8,000,000, and Chicago $50,000,000 a year, and the whole country over $500,000,000 a year, in damage done to merchandise, defacement of buildings, tarnishing of metals, injury to human and plant life, increased cost of housekeeping, and losses to manufacturers due to imperfect combustion of coal.

Automobiles

$80,000,000 Invested in Electric Vehicles.—According to statistics collected by T. C. Martin, chairman of the committee on progress to the National Electric Light Convention at Seattle, recently, there are at present invested no less than $80,000,000 in electric vehicles, of which sum about $25,000,000 represents the outlay for trucks and delivery vehicles, and $55,000,000 the value of pleasure cars.

Huge Racing Car Coming.—A specially built, 300 horse-power Benz racing car soon will make its appearance in America. The car is said to have been purchased by a well-known race promoter and will probably be driven by Robert Burman, holder of the world's record for straight-away speeding, in an endeavor to lower his own record of 25 seconds for the mile. The car is reported to have made a mile in 21 seconds, or almost three miles a minute.

Yellowstone Park and Automobiles.—Representative Rucker has petitioned the United States Government to open Yellowstone Park to automobiles. This famous park is still closed to motorists, and it is claimed that there is no valid reason why it should remain so. The present-day automobile is a different thing from the unreliable noisy contraption which was excluded from the park years ago. There appears to be a growing disposition on the part of those responsible to open the park to tourists and their motor cars.

Motorist Poisons Fish by Carbide.—An American tourist had a peculiar experience recently in Southern Bavaria. Passing by a small stream, after a long trip, he stopped his car to empty the old carbide from his acetylene generator and refill it. A few days later he received a note from the supervisor of the county, notifying him of a suit for damages entered against him for poisoning the fish in the river with carbide. It seems that the part of the river had just been stocked with bass, and many had been killed by the gases developed by the carbide residue.

London Introduces "Reversible Omnibus."—Because of the narrow streets in several parts of the city of London it has been found impossible to use the ordinary motor omnibus on account of its comparative length and the attending difficulties of turning the bus around at the end of a trip. Some of the routes laid out for the motor buses are circular, thereby obviating the necessity for making complete turns. On some occasions it has been found impossible to map out circular routes, and a new type of bus is being tried out, which is reversible, the same as a trolley car. It can be steered from either end, conductor and driver simply changing places.

University Establishes Automobile Science Course.—The first university in this country to recognize the importance of the motor car and to place it on an equal footing with the building of bridges, railroads and tunnels, with chemistry and other sciences, is the University of Southern California. The new course is for the benefit of automobile mechanics, engineers and designers, and the first professor of automobile science is Stanley Smith, C.E., who has just been appointed to the chair. While he will deliver lectures on the various subjects properly belonging to automobile science, he will specialize on motors and their efficiency, sliding, poppet and rotary valve types, etc.

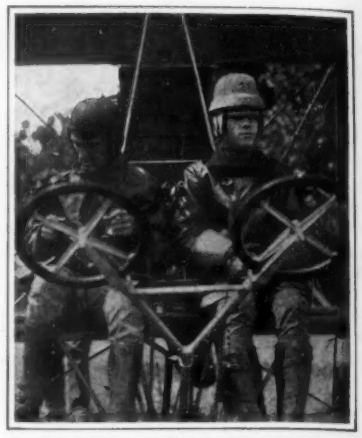
Military Exemption for French Motorists.—For the purpose of facilitating the transportation of the general staff in case of war, the French military authorities have decided to give those who own cars of medium horse-power, and who are able to prove their ability of driving them and taking care of them as far as tires and ordinary road repairs are concerned, a special opportunity to discharge their military duties in an agreeable manner. Instead of being compelled to drill with the other conscripts, such owners must sign an agreement with the authorities that they will turn over to the government immediately following mobilization the vehicles described in their application for this sort of service. At all maneuvers the car must be at the service of the military authorities, to be driven by the owner himself under orders from the officers.

Mysterious Fire from Odd Cause.—A German motorist the other day discovered the most extraordinary cause of a fire starting in the carbureter of his automobile that has ever been brought to public notice. Noticing a leak in his carbureter connections, he stopped the car in a completely deserted road in full sunlight. There was no spark, fire, match, broken insulation, or any other thing that could possibly have caused the gasoline to catch fire; yet in a few moments the carbureter was ablaze. Luckily the motorist was something of a scientist and he started on an investigation of the "why and wherefore"—after he had managed to extinguish the fire. To his surprise he discovered that the catch on the convex front lens of the headlight had become unfastened and the lens had swung around in such a manner that the sun's rays became focused directly on the leaky connection at the carbureter; a highly effective burning glass being thus responsible for the "inexplicable" blaze.

The Burgess-Wright off on a reconnaissance.

The Aeroplane in the Military Maneuvers

The War Operations in Connecticut Clearly Point to the Necessity of Having a Large Well Trained Corps of Aerial Scouts in Our Army, Equipped With Machines Capable of Rising from Unfavorable Ground With Two or More Occupants



Lieuts. Milling and Foulois in the Curtiss machine.

NO doubt the most important feature of the mimic war in the hills of Connecticut has been the scouting of the aviation squadron. This is the first time that aeroplanes have played an important part in any military maneuvers in this country, and their work has been exceedingly gratifying. After the region in which it was decided to hold the maneuver had been selected, it was gone over very carefully to find a suitable field from which the movements of the troops could be directed and where the aeroplane squadron could have its headquarters. In this entire territory of 240 square miles, only one spot was found where there was a stretch of three hundred yards practically level and untimbered. Here the headquarters was established and the field was prepared to permit of launching aeroplanes. The engineering corps worked for a day dynamiting the rocks and succeeded in clearing one hundred and fifty yards near the southern end of the field. To the south of the field was a heavily wooded tract, while the north end was closed by a low stone wall. The field was so narrow that the aviators were compelled to start always toward the north regardless of the direction of the wind. This made it particularly difficult because the prevailing winds were at the back of the aviators. Owing to these conditions it was next to impossible to launch a machine with two passengers. In the aviation squad, there were two machines belonging to the regulars and one machine of the New York National Guards. The latter was a Curtiss machine, piloted by Private B. Havens. It was equipped with a 75 horse-power engine, but its wing spread was not great enough to permit of launching the aeroplane under the unfavorable conditions with a passenger. Consequently, the pilot had to go aloft alone and make his own observations. Not being a trained scout, he found great difficulty in observing the armies, and could not distinguish between the various bodies. The Curtiss machine of the United States Army was piloted by First Lieut. T. DeW. Milling of the Fifteenth Cavalry. This machine was also found to have too small a wing spread to lift two men off the ground from the field at Paradise Green. The attempt was made at one time and it came very near to resulting disastrously. With Lieut. Milling was the lightest member of the aviation squad, Lieut. Geiger. The wind behind the aeroplane drove the machine along so rapidly that it reached the end of the field before it could lift itself more than a few feet off the ground. Both occupants of the machine thought that they were doomed, but they succeeded in just clearing the three-foot stone wall by a few inches. They also narrowly escaped collision with the woods at the end of the next field. So narrow was their escape that it was decided to make no further attempt at carrying a passenger until wing extensions could be secured.

The wireless apparatus on the Burgess-Wright.

Note the telegraph key at the extreme right of the picture.

Curtiss aeroplane clearing the stone-wall

The other regular army machine is a Burgess-Wright. Although furnished with an engine of but 50 horse-power, and capable of making but forty miles per hour, this machine had no difficulty in rising from the field. But Pilot Lieut. B. D. Foulois had equipped it with a wireless telegraph apparatus, the weight and disposition of which made it impossible to carry a passenger. Two other machines which were to have been on hand for the maneuvers were injured on their way to the field. One of these, a hydro-aeroplane, was wrecked in Plymouth Harbor. This was very unfortunate because there would have been a good opportunity to launch a machine from any desired point on the Housatonic River against the wind, regardless of the direction in which it was blowing, and with a passenger, the observations made would undoubtedly have been much more complete than was possible with the pilot flying alone.

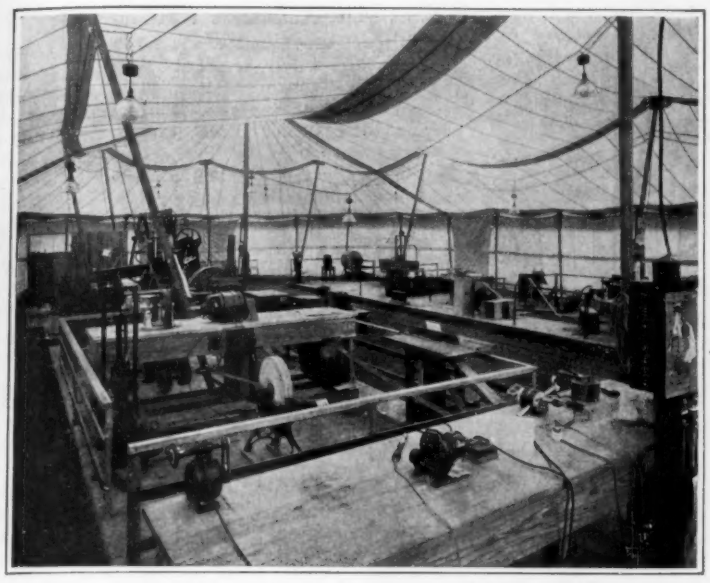
During the first half of the maneuvers the aeroplane squadron was neutral, and was required to report the position and movements of troops on both sides. A problem would be assigned to the aviation squadron requiring it to make a reconnaissance as soon after dawn on the next day as practicable, covering a fixed territory usually a triangle, the points of which were given. The instructions were made somewhat ambiguous, so as to test the intelligence of the men. For instance, on August 12th the order was given that "the triangle, Stratford, Derby, and Long Hill, be examined for the location, composition, and strength of the military forces covered therein, results being reported at headquarters, as soon as practicable." On up to midnight the squadron pored over the map, studying carefully the territory and trying to make mental pictures of it. It was found that there were two Long Hills, but one of them was eliminated, because it lay practically in a line with the other two points. It was assumed, therefore, that the other Long Hill must be the one referred to, even though it was not so prominent on the map. Their reasoning proved correct.

The aviation regulations required that they carry registering barographs and wrist aneroids. They were required to fly

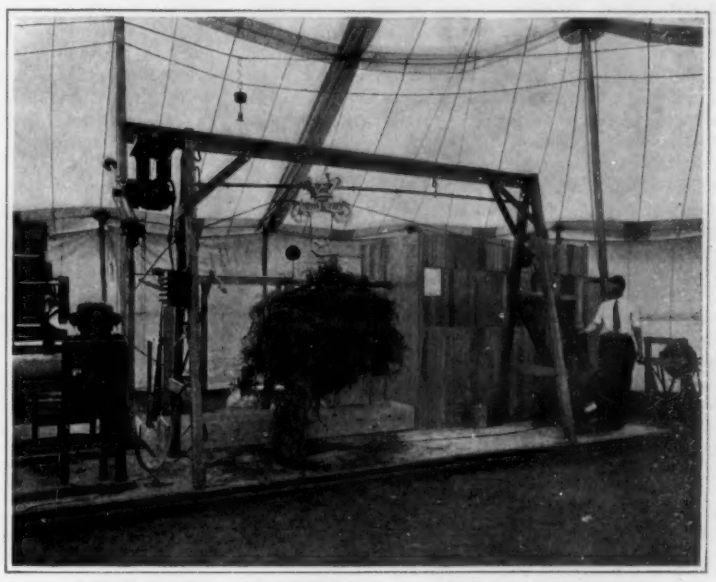
(Continued on page 170.)

The wireless station at headquarters.

The generating set of the wireless station.



A view of several of the sections within the tent.



Demonstration of the electrically operated hay unloader.

Teaching the Farmer How to Use Electricity

A Circus Tent Display of Farm Apparatus by a Central Station Company

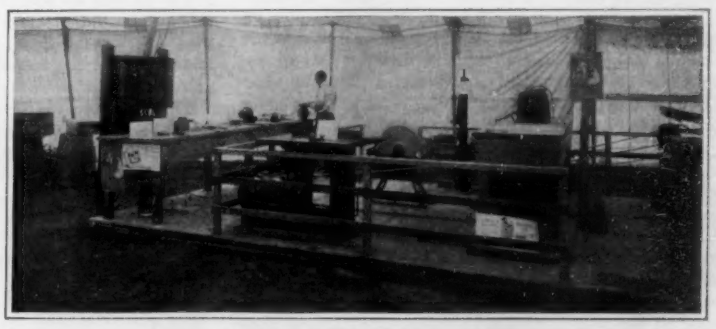
By Thomas Commerford Martin

FOR some years past the machinists and electrical manufacturers of the country have been going through an elaborate process of adapting the machine tool and the electric motor to each other, whether for belt or for direct drive; and the development in this important field of industry may at last be regarded as fairly complete; for there is literally no art into which electric power has not now made its way. Indeed, in many branches of production it is already the leading source of energy. This chapter of electrical history succeeded that of the trolley, which in turn devolved from the electric lighting period; and the results of all these epochs are to-day converging upon the efforts that electricity is making to win for itself one of the oldest domains of human endeavor—agriculture. Thanks to the ever-progressive policy of this journal, the readers of the SCIENTIFIC AMERICAN have been made aware of the remarkable advances effected lately in rural districts by electric light, heat, power, and traction, and will also have noted that after all the work has but barely begun, leaving still an infinite opportunity for the engineer, the inventor and the farmer. It is certainly significant of coming changes that this year the subject has been formally presented to the United States Department of Agriculture for study; that the United States Bureau of the Census is seriously considering making it a special part of the electrical census of 1912; and that both the American Institute of Electrical Engineers and the National Electric Light Association are making it the topic of frequent papers and committee reports.

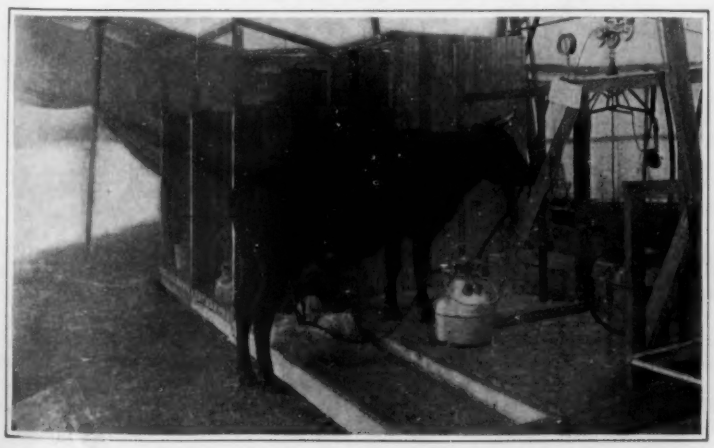
All this new interest, stimulated of course by the high cost of living, the "back to the farm" sentiment, and the greater wealth of rural communities, has been due largely to the fact that the new power transmission systems, looking for a market for their current, are themselves unavoidably throwing a network of circuits over vast agricultural regions, so that in reality the market sought lies immediately around them. Relatively few farmers can afford to put in generating plants of their own, but when the aerial tracks for lighting supply run right by their doors, it is easy and cheap to tap them for even a very small local consumption. This is what is now going on over large areas particularly in the West and on the Pacific Coast, but there is another extremely interesting aspect of the matter to which the present article draws attention. The city central station systems once limited to small urban districts have expanded into the outlying regions to such a degree that where they formerly served but a few square miles of territory they now embrace hundreds. Thus the North Shore lines forming an outer ring to the Chicago system with which they are "tied in," are already supplying electricity in a region of 1,200 square miles with seventy-one towns and villages; and the old Boston Edison Company, not long ago centered tightly around the famous Tea Wharf, operates actively in a principality not far short of 700 square miles. This district, while very populous, is also decidedly rural, with heaven alone knows how many farms and market gardens in it; and hence we find the company, in a highly original way, making a strong play for the farmer's patronage. Within Boston it has been spending over $100,000 a year in publicity to exploit the electric vehicle; and now with protean versatility, it is spending probably an equal sum in trying to electrify the countryside. Such enterprise and ingenuity as are being displayed would seem likely to enjoy a rich reward; at any rate it is only in this manner that the thing can be given a real test.

One of the great problems, of course, in introducing

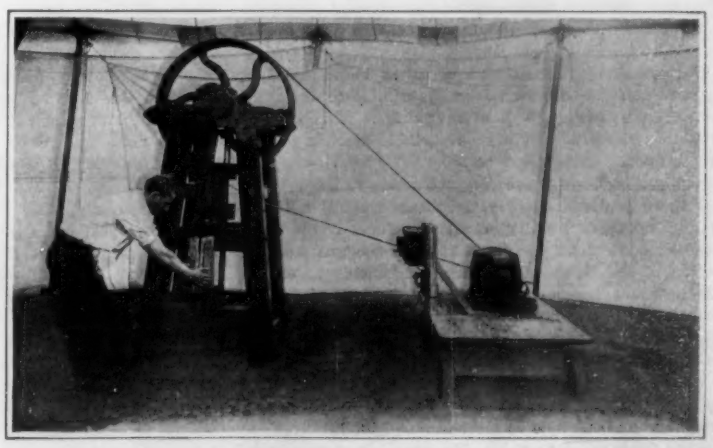
Exterior view of the tent showing electric farm trucks.



A corner of the workshop section.



Standing at attention at milking time.



The wood splitter in operation.

electrical farm apparatus is that of reaching the prospective customer, rather remote from factories and stores and hard to convince by even the cleverest advertising and literature. The "prospect" has got to be shown that it is to his benefit to adopt the innovation, and even then will be loathe to invest. In one or two sections of the country the electric power company has aimed to meet the question by buying a farm in the heart of a likely district and operating it on an electrical basis, so that the neighboring folk can see for themselves how it works out. This is a slow method, and, besides, very often a farmer does not want, or need, to electrify his whole farm, but prefers to get some special appliance of a particular make. The plan of the Boston Edison Company has, therefore, been to invade its rural territories with a live demonstration, and to move the show from place to place, so that the whole population within the belt—say 750,000 people—can be convinced, the old farmers converted, and lots of citizens hungry for farm life shown that it is feasible for them, shorn of its wonted drudgery.

It is thus a traveling circus that the company has in operation, and the novelty of that feature alone helps to attract visitors. The number of practically interested people inspecting it has averaged about 100 a day right along, to say nothing of any number of persons and children lured by mere curiosity; but even they are not to be despised. With an occasional band of music and the regular pink lemonade concomitants, the "Circus Farm," when in full operation is a fair rival of the sawdust ring as an amusement, altogether aside from the fact that it is giving instruction, and has already set the wits working of many a shrewd and inventive observer, who sees at once that here are new ideas and phenomena in the shaping of which he may play a part, as applied to the greatest and oldest industries. The Circus Farm is a big canvas tent, 60 by 100 feet, under which is housed a grouping of some forty large pieces of apparatus and farming tools, supplemented by thirty or forty ordinary and smaller appliances. All the apparatus is ready for use, and runs, and demonstrates its economic service on the farm. Each appliance is plainly marked with its name, the manufacturer, its price, and the cost of operation. The price is retail and includes the machine, its motor and everything ready for actual service on the farm. Some machines and tools have been omitted from the exhibition because they have been regarded as unpracticable—at least for use in New England territory. Others are not shown because it has not been possible to "standardize" them, that is, furnish them to the purchaser with "everything all on" ready for operation.

For the first five weeks the farm was located on the Old Middlesex South Fair Grounds in suburban South Framingham, easily reached by the electric car lines. The main poles of the tent are surmounted with pennants, and in front of the main entrance have been placed three large canvas display signs in striking colors to add some of the "drawing" effect of a high-class circus. The scheme has proved effective. A broad, main passageway extends down the center of the tent from end to end. On either side are the working exhibits protected from the visiting throng by railings. The tent is brilliantly lighted at night with 500 watt incandescent lamps, and the outside grounds are made brilliant with luminous arcs.

Two electric trucks, one of two-ton capacity and another of 700-pound capacity, are used in connection with the farm for hauling material to and fro. A special feature of the truck service has been in demonstrations to the neighboring farmers. Wherever the farmers have shown an interest in the truck proposition, the vehicle suited to the service has been sent out to haul loads around on the farm. From time to time material has been carried from farms into town, or *vice versa*. The result has been that many of the farmers have now practical knowledge of the working efficiency of an electric truck on the farm, and are considering its adoption.

The farm is equipped with a motor on a portable truck, which can be moved from place to place and connected up with any piece of apparatus. This shows, of course, the practicability of portable electric power on the farm.

The milking tests prove very attractive to the people, and there is always a crowd at the evening milking time. Practical milking demonstrations have been given at large nearby dairy farms, to the great satisfaction of dairymen. The farm is resulting in excellent business, and many of the purchases of electric appliances are traceable directly to the inspiration and information gained there.

Obviously, there were many incidental difficulties in carrying out this ingenious scheme, but with a supply of power always at hand from its own circuits, the company has been able to meet them. Like all circuses moving from point to point, the question of transportation has to be dealt with, but here the electric truck has a great chance to prove itself under genuine country conditions. In order to keep the circus going steadily, the company has two tents, so that the next site can be selected and one tent set up before the existing circus is moved on and the other tent taken down. Hence, the apparatus has its home awaiting it, is protected from undue exposure, and can at once hitch to the waiting circuits.

In addition to this "Circus" or "County Fair" of its own, the Boston Edison Company has worked out a kindred idea in its "Edison House," which aims to show the farmer or the suburbanite how electricity can also be utilized indoors as well as out. This model dwelling is portable, and is moved from village to village, being set up in each place with appropriate and pretty floral surroundings. It is always put in charge of some local woman of intelligence, and all the women's sewing bees and local clubs can make use of it—which they do freely. Kitchen, living room, cellar, dining room, bedroom, porch, woodshed, are all equipped thoroughly, and it is difficult to think of any domestic operation that is not here shown under full electrical conditions. It is inevitable that such missionary work should tell in the long run, and that in this way, with the aid of electricity, the farmer's life will be made more endurable, more inviting, more profitable. Edison has said that hoeing corn is, from his experience, one reason why large cities exist. Here are reasons why people will not go back to the farm, because they will never leave it.

A Forest Service Circular on Quebracho Wood

IN response to frequent requests received by the United States Forest Service for information relative to quebracho wood, its uses and substitutes, a short circular has been prepared. Quebracho, an Argentine wood, is very important for the tannin it contains and a need is keenly felt for fuller information regarding it, based upon a scientific study of its structural characters. In general appearance the wood is scarcely distinguishable from two other Argentine woods called white quebracho and red quebracho, which yield tannin in a much smaller quantity. A study of the chief distinguishing characters of true quebracho and these two possible substitutes will prove very helpful in detecting the inferior kinds when they are mixed in with the genuine.

The indiscriminate use of the name quebracho has resulted in much confusion, which called for a discussion in order to clear up the nomenclature of the different woods referred to under this vernacular name. The circular is not a treatise descriptive of the many species of tropical and subtropical woods now known as quebracho, but it is devoted chiefly to a discussion of the distribution, supply, uses, and importation of true quebracho into the United States. Perhaps the most valuable portion of the circular is a clear detailed statement as to how the true quebracho can be distinguished from its substitutes. In a discussion of this kind so many unfamiliar terms are generally employed that the lay reader will not be attracted. The aim of the authors has been to substitute the simplest terms in the discussion of those parts of the wood and its uses which are most likely to be of interest and importance to the general reader and the user of quebracho wood. In this the authors have been successful and the subject is treated in an untechnical and popular, yet accurate, manner.

This study on the structural characters of true quebracho and the spurious kinds, affords an interesting illustration as to how apparently similar woods may be easily distinguished by means of a simple pocket magnifier or a compound microscope. Well selected photographs of magnified transverse and longitudinal sections have been included for the purpose of illustrating more clearly in what respects these woods differ.

Uses for Useless Metals

AN immense fortune, according to economic geologists, awaits the man who can invent a use for tellurium. This mineral is one of the by-products of copper refineries and of plants working up gold telluride ores. At present it is all thrown away, as it is absolutely no good to anybody. Only a few years ago tungsten was in very much the same position as tellurium is now. Then it was found to be highly useful in the manufacture of incandescent lamps and tool steel, till to-day it would seem probable that with a cheaper supply it will become one of our most important minor metals. Selenium is another substance which has just come into its own. Up to a year or two ago no commercially important use for selenium was known, although for some three or four years it was one of the ingredients entering into a secret process in the glass industry. It is now well known among scientists that selenium is an agent in coloring glass red, and in decolorizing glass by the use of small amounts to neutralize the green of ferrous iron. A French scientist has also utilized it in an invention by which pictures may be transmitted by wire. Like tellurium, selenium is a by-product derived from the refining of copper. Apparently about twenty tons a year are now utilized commercially.

The Automatic Word-maker

THE blunders of an inexpert typewriter, regarded as blunders merely, do not at first sight, offer much scope for agreeable meditation, either to their perpetrator or to other people. But regarded as phenomena, physical and mental, they are found to be not only interesting matter for study, but valuable contributions to science and scholarship. For, instead of being the mere accidents of careless or awkward fingers, they are really the product of psychological law, and the creators of a new vocabulary.

There is, for instance, the propensity to write a letter twice over. The finger receives an order to touch a certain key, and responds with twice the service called for; like the genial converser of whom Emerson speaks, who, when he has said a good thing, straightway says it over again.

A modification of the same action is that of following a capital with the corresponding small letter, as *Ccork, Rrome*. One wonders if Aaron, Lloyd and their like might have originated in an analogous way.

Again, when a double letter is called for, the order often seems to have been misunderstood, and the wrong letter is doubled, as *lokk* for look, or *faal* for fall.

Still more singular is the tendency to anticipate in one word a letter belonging in the next, as *lask week* for last week.

The most surprising and amusing effects of all are those produced with machines having "shift-keys" for capitals and figures, when one pushes the wrong lever, and having rattled off what he believed to be the word EDUCATION, sees in its place 3$7?&589, or, intending to date a letter 1910, reads QOQP.

In all these blunders except the last it is easy to detect the principle of the time-element in volition. The operator usually foresees the mistake before it is made, but is unable to prevent it. He knows that he has directed the finger toward the wrong key; but he is unable to recall the order and issue the correct one in its place in time to prevent the result. The finger persists in its course in defiance of its owner's will, finds the key to which he had originally directed it, and prints the obnoxious letter in spite of him. This is one of the commonest and most surprising of his experiences. It is also one of the most interesting from a psychological point of view.

But the psychological result is not the only one accruing from this process. The verbal product is also striking and significant. Along with all this irregular and seemingly haphazard mental action, there emerges an original vocabulary, surprisingly copious and interesting. The typewriter is a prolific creator of new words. Besides the frequent substitution of one regular dictionary word for another, and the production of confused combinations that are not words at all, it turns out a multitude of words that are well formed, pronounceable, and even euphoneous, but which no lexicographer ever heard of.

The writer has for many years been in the habit of setting down these machine-made words, as they spelled themselves out under his eyes, until there has accumulated a vocabulary large enough to furnish some new-born nation with the nucleus of a language. From between two and three hundred that have been preserved, not one of them intentionally produced, the following one hundred will serve as examples:

ablo	dera	het	neen	soem
actice	dinf	huse	newa	sporn
af	efaf	ir	nive	stry
agarm	epon	id	ond	stang
ang	ew	ite	ot	stoct
aming	ferly	impuse	ovet	suss
agice	fing	inti	parton	tere
aspa	firat	jud	persol	thar
attan	fird	kint	poan	trem
bak	firt	kep	privare	trult
begil	foing	leace	ract	ud
bereen	fot	libarm	repor	urd
bome	fron	lokk	rhe	vety
eance	gollen	lond	ruter	walg
eire	goom	manf	savoor	wam
eonse	grear	meto	serim	waw
ere	hace	minf	sevond	whid
deat	hald	mosy	serim	whix
depene	havet	mu	shoy	yont
detiture	hels	ned	sme	yoy

This is but part of the product of a single typewriter, not very constantly used. Every one of these words, and hundreds besides, were absolutely accidental. Many of them were produced several times over, *trem* seven times, and *id* and *ir* five times each. Could we add to the list the product of the myriads of other machines, each, no doubt, despite the skill of the most expert operators, more or less prolific of similar creations, we should have material for a new unabridged dictionary and a new language.

A machine for the production of a set of new ideas to fit these unappropriated terms is next in order.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Paraffine for the Obstinate Collar Button

To the Editor of the SCIENTIFIC AMERICAN:

In re collar fastenings, the present collar button works perfectly well if the back of the buttonhole is rubbed with paraffine. A pin, too, if rubbed with paraffine, passes through starched linen "like greased lightning through a barberry bush." W. S. B.

Geneseo, N. Y.

A Card Trick

To the Editor of the SCIENTIFIC AMERICAN:

This is an old favorite this side. It was taught me by an old cavalryman more than fifty years ago. His formula was: "Eight kings threatened to save nine fair queens for one sick knave." This, in my experience, rather more mystifies the beholders than that of "Regular Reader," on page fifty-five of your issue of July 20th.

London, W. C. E. J. KIBBANVITE,
Editor English Mechanic.

An Engineer's View of the Patent Bills

To the Editor of the SCIENTIFIC AMERICAN:

Please allow me to thank you, as an inventor, for the splendid article in issue of August 3rd, 1912, regarding the Oldfield Patent Bill. If you only knew how many inventors need a champion like you I am sure you would feel well repaid. The plain words you use should appeal even to a Congressman. The Government is a plain swindler when it grants us the exclusive right to make, use and vend our inventions, after taking our money, as it does not attempt to make its word good. CLAUDE L. HAGEN.

San Francisco, Cal.

The Automatic Stop on Railroads

To the Editor of the SCIENTIFIC AMERICAN:

The recent disastrous wreck on the Lackawanna at Gibson seems to be only another of the already many and grewsome arguments in favor of the adoption of some form of automatic stop in connection with the block signals. Under present conditions the mere fact that a signal does its work properly is no guarantee that the danger will be avoided, since so much is left to the "human element." Rain, sleet, snow and fog are factors to be considered and have time and again proved the inadequacy of even the most perfect block system. The automatic stop is not new, having been tried and found successful under certain conditions of city traffic, and its general adoption for main line railroad work would not only be an added safeguard to passengers, but moreover would undoubtedly pay for itself in reducing such costly accidents as the recent Fourth of July wreck.

This letter is written in the hope that you will take up in your editorials the question of automatic stops, a measure which seems to be only too urgently needed under the present conditions of fast passenger service.

Sangerfield, N. Y. WILLIAM CARY SANGER, JR.

[This matter formed the subject of an editorial in our issue of July 20th.—EDITOR.]

The Nut Problem

To the Editor of the SCIENTIFIC AMERICAN:

General solution for any number of men, n, and any number of monkeys, m, less than n.

Let x = number of nuts in last quotient.
y = number of nuts originally.

It is evident that we can pass from x to y by multiplying x by n, and then performing, n times in succession, a cycle of operations consisting of multiplying by $\frac{n}{n-1}$ and adding m.

Therefore,

$$y = \frac{n^{n+1}}{(n-1)^n}x + m\left(\frac{n}{n-1}\right)^{n-1} + m\left(\frac{n}{n-1}\right)^{n-2} + m \quad (1)$$

$$= \frac{n^{n+1}}{(n-1)^n}x + m\frac{n^n-(n-1)^n}{(n-1)^{n-1}} \quad (2)$$

$$= \frac{n^n}{(n-1)^n}\left[nx + m(n-1)\right] - m(n-1) \quad (3)$$

$\frac{nx+m(n-1)}{(n-1)^n}$ must evidently be integral $= z$, say (4)

z, x, and y are positive integers.

Also, when z is least in value, x and y are least in value.

Substituting from (4) in (3):

$$y = n^n z - m(n-1) \quad (5)$$

From (4):

$$x = \frac{n-1}{n}\left[z(n-1)^{n-1} - m\right] \quad (6)$$

Expanding the parenthesis, n divides formally every term except the last two, which, when n is odd, are $z - m$.

The least value for z in this case is $z = m$. (7)

When n is even, the last two terms are $-z - m$. This expression cannot be zero, and must, therefore, contain n at least once, numerically.

Therefore,

$$\frac{-z-m}{n} = -1 \quad (8)$$

$$\text{or } z = n - m \quad (9)$$

which is the least value for z when n is even.

Substituting from (7) and (9) in (5):

$$y = n^n m - m(n-1) = m(n^n - n + 1) \quad (10)$$

when n is odd,

and $$y = n^n(n-m) - m(n-1) \quad (11)$$

when n is even.

(10) and (11) give the least solutions.

In order to include other solutions, we must evidently add a term of the form pn^{n+1}, where p may have any positive integral value, including zero.

Therefore, the general solution is:

$$y = pn^{n+1} + m(n^n - n + 1) \quad (12)$$

when n is odd,

and $$y = pn^{n+1} + n^n(n-m) - m(n-1) \quad (13)$$

when n is even.

Illustrations.

In (12) let $p = 0$; $n = 5$; and $m = 1$;

then $5^5 - 5 - 1 = 3{,}121$, the least value, which is the answer to the original problem.

Let $p = 1$

$$5^6 = 15{,}625$$

18,746, the next value, etc.

For 4 men and 3 monkeys:

In (13) let $p = 0$; $n = 4$; $m = 3$.

$4^4 \times 1 - 3 \times 3 = 247$, least value.

1 subtract $4 \overline{)\,247}$ $(61+3)$

2 $4 \overline{)\,183}$ $(45+3)$

3 $4 \overline{)\,135}$ $(33+3)$

4 $4 \overline{)\,99}$ $(24+3)$

5 $4 \overline{)\,72}$

18

For 10 men and 1 monkey.

In (13) let $p = 0$; $n = 10$; $m = 1$.

$10^{10} \times 9 - 9 = 89{,}999{,}999{,}991$, least value.

SUBSCRIBER.

Conservation of the Atmosphere.

To the Editor of the SCIENTIFIC AMERICAN:

A recent article in the SCIENTIFIC AMERICAN attracted some attention on the subject of an exhausted atmosphere, or rather, the depletion of the oxygen from the atmosphere. After reading it, the writer asked a college professor if he believed there was a real danger of exhausting the oxygen in the air.

He replied that he guessed that it would last as long as he did.

But this reply will not satisfy the scientist, who is weighing things in scales that weigh a hair, nor the philosopher, who reasons long over trifles light as air. This marvelous atmosphere of ours is not a chemical compound, but a mechanical mixture of two gases, oxygen and nitrogen, in the proportions of 20 and 80 per cent, respectively.

The oxygen being the active element, and the nitrogen the diluent or vehicle for the other gas, the normal atmosphere exists in a balanced state, i. e., the loss of oxygen is continually replaced by the plant life, which has the power, in the presence of sunshine, of decomposing the carbonic acid gas produced by respiration of the animal life into its elements, when the green leaves of the plants absorb the carbon for their own tissues, and restore the oxygen to the atmosphere in its original purity.

Carbonic acid is continually added to the air in the various processes of nature, as respiration, combustion, oxidation, fermentation, putrefaction, and so on. Between the processes just mentioned on the one hand, and the absorbent power of plant life on the other, in the normal state a balanced atmosphere is maintained.

In the wisdom of the Creator this action was to be reciprocally maintained until the end of time, but man has disturbed this beautiful balance by introducing new methods and processes ultra-natural.

Ergo, new problems are introduced, which must be considered. How long will this equation stand subtraction on the one side without compensation on the other side? The constant loss of oxygen must be felt, and we claim that the grave increase of germ diseases, and their fatal recurrence, the lack of vitalizing power in the air, the marked climatic changes, the droughts, and fluctuations of temperature, and other variations from nature, are results of a steady consumption of the life-giving properties of the air. Of course, this change would be noticed first by trained observers, then more apparent, and finally be obvious to all. The feverish activity of this commercial age is rapidly consuming stores of coal, iron, and timber, that might last for ages.

The intense industrial age in which we live is producing an over-balanced condition of the atmosphere, that must surely react in danger, disease, disaster, and death. But what is the remedy?

Suppose there be none! Just suppose that this acceleration go on, what will it culminate in? For example, the ocean speed craze; the intense rivalry that has existed between the three great lines of trans-Atlantic steamers, Cunard, German, and White Star.

We know to our sorrow how that has culminated, in the loss of the mighty "Titanic," ramming an iceberg at midnight, under a speed of 21 knots with the awful penalty of 1,600 lives. But who pays the penalty? The American people. Take the motor car speed mania. Faster and faster, sixty, seventy, a hundred miles an hour. But who pays the penalty? The American people.

Aviation is the same; he flew, he fell, he died. The same story all around. Acceleration beyond the limit of safety. Sad, is it not?

I repeat, the people are unbalanced, and so is the atmosphere in which they live. Let someone disprove it, if he can.

But to return to our problem of the air we breathe sixteen times a minute. How shall the atmosphere be conserved?

The air in which we live exerts a normal pressure at sea level of 14.73 pounds to the square inch, which is produced by the super-incumbent atmosphere extending up for possibly a hundred miles. Our life is dependent upon the state of this air. It is capable of a certain amount of saturation, expansion, depletion, infection, compression, exhaustion, and restoration.

Let us notice briefly some of the ways in which the air is vitiated.

First, positively, by combustion. Vast tracts of forest timber have burned down annually, and every acre burned must not only be added to the positive side of the equation in the products of combustion, but also be subtracted from the side that furnishes the power of restoration. But to the loss of vegetation, by which the carbon dioxide is separated, there is an additional loss of moisture-producing medium to furnish aqueous vapor. Where is this loss compensated?

Second, negatively, by loss of aqueous vapor. This is essential to health, as the electricity in the body is rapidly dissipated under certain conditions. And disease is induced. Saturation beyond a certain point reacts toward depression. Natural balance is maintained by the sun and wind, and evaporation; the air taking up all the moisture it is receptive of, and conveying it over wide areas.

Third, absolutely, by depletion or exhaustion, and by infection. The cities are filled with air-depleting plants, that exhaust the natural restorative properties of the atmosphere. Hundreds of power plants, foundries and furnaces exhaust the oxygen and electric properties of the air, while loading it with the suffocating products of combustion. Smelters consume the vital, and add the lethal.

By infection the air takes up bacteria in dust, and distributes them widely along city streets, and in crowded stores and offices, on trains and otherwise. The system depleted of vitality cannot resist these unseen invaders, and easily succumbs to disease. Of course, the total amount of oxygen in existence is not lessened, but is rendered inoperative.

The final question to be met is regarding conservation and restoration of the atmosphere. How to conserve and how to restore? If natural law could prevail, a balanced atmosphere would be maintained, but it is a serious question indeed.

Closely allied to this are the problems of forest conservation and water storage, which we hope to take up in a future article.

We respectfully submit that there are certain inalienable rights declared in the immortal document and secured under the Constitution as being common to all men. Among these are life, liberty, and the pursuit of happiness. The right to live and to be free and happy.

Necessary to life and enjoyment of it is health, and this cannot long be maintained under the adverse conditions of impure water and infected air. Much has been done to secure a supply of pure water in our cities, but the air is just as much a common menace as ever. There are times when the only breathing places are the parks, the river front, and the shore; but how many of the poor never see them.

Air is the universal medium of life, and as such should be properly conserved, like any other universal privilege.

"All experience has shown that mankind will suffer, while evils are sufferable, rather than to alter or abolish the evils to which they have become accustomed."

Schroon Lake, N. Y. WILLIAM MARSH.

The Harbors of the Pacific Coast

Terminal Facilities for the Panama Canal Trade

By Wm. Hosea Ballou Sc.D.

THE coast line of the Pacific coast of the United States is defined by the United States Coast and Geodetic Survey as 1,852 miles long from headland to headland, and 8,900 miles long with indentations. Originally its natural harbors may be said to have been confined to San Francisco, San Diego, those on Puget Sound and the Columbia River. As populations increased in California, Oregon and Washington, there was a corresponding growth in water-borne traffic, and Congress, from time to time, made appropriations for the improvement of rivers and harbors. Oregon has received the greatest sum, $24,500,000; California's appropriations have totaled $19,300,000, and Washington has been granted $10,175,000.

To the above should be added the immense outlay for railway terminal wharves, municipal wharf systems, and the expenditures by corporations and individuals, bringing the approximate total up to probably over $100,000,000.

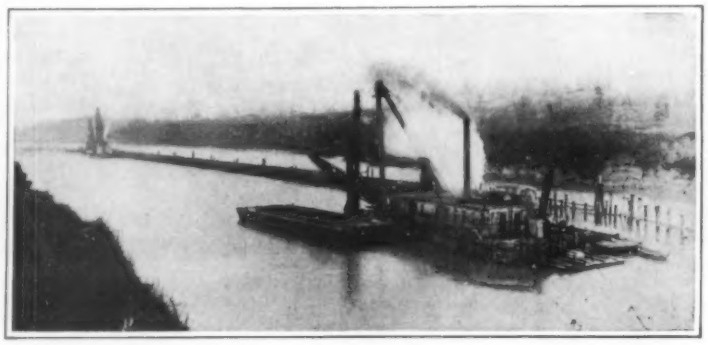
State of Oregon.

PORTLAND HARBOR.—Portland is located on the Willamette River, 12 miles above its entrance into the Columbia River, which is 110 miles from the mouth of the latter, and at present is the head of deep-water navigation. Light-draft boats may ascend the Willamette 150 miles. By using the State portage road between Celilo and Big Eddy, they may ascend the Columbia and Snake rivers during higher stages for an additional 537 miles, this last stretch being the greatest of American logging and rafting waterways. Logs from 20 to 90 miles inland are floated over tributaries to saw and shingle mills upon its banks. Rafts of logs and piling timbers, of 6,000,000 feet each, are towed over it during the season, and thence by ocean to California ports. The annual commerce amounts to eight million tons, valued at $75,000,000, of which a little over one half is sea-going.

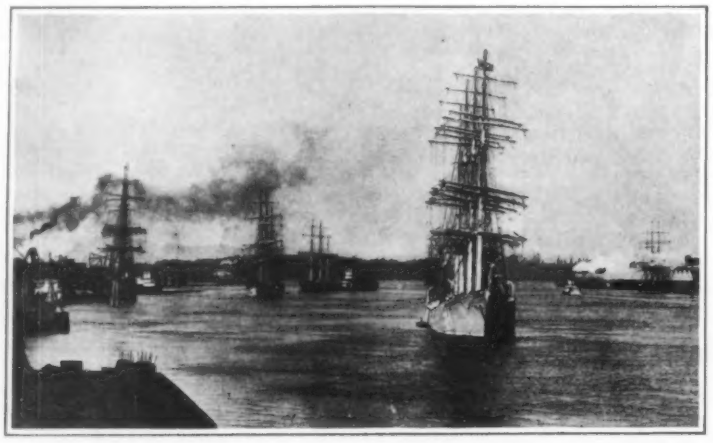
Congress is asked to appropriate $1,344,000 additional for use this year in continuing the jetty work at the mouth of the Columbia River, bringing up the total expenditure to date of $11,488,000. More than as many millions will be required before this important entrance is under permanent control, and it is doubtful if its annual maintenance for dredging, etc., will ever be less than at present, about $105,000. Of the projected seven-mile jetty (the longest, by far, ever conceived), only about 19,000 feet were completed on the first of June, leaving some 18,000 to be constructed on the ocean end, in at least 40 feet of water. When it is finished, there will be still the north jetty to build—two thirds as long, and as costly. At the present rate of construction, it will require twelve years to complete the present south jetty and sixteen years to build the north jetty. Thus, a total of twenty-eight years must elapse before Portland can hope for a 40-foot channel such as admits shipping to New York harbor. Of its vast utility and necessity, however, there can be no doubt. The mouth of the Columbia River, which it is to control when completed, is 8,000 feet wide. The navigable channel within it swings like the nervous coils of a snake, moving its position 2,500 feet annually, first one way and then back again. The necessity of jetties on both sides, to compel the channel to remain in one place, is thus shown, so that by the use of dredges, it may be kept at the required depth.

COOS BAY.—Coos Bay is the second Oregon harbor in size, and it presents no especial natural difficulties to overcome. Vessels drawing 22 feet of water may now cross the bar at high tide, enabling the port of Marshfield to handle, last year, 500,000 tons of freight and 25,000 passengers, between it, San Francisco and Portland. The harbor is 180 miles south of the mouth of the Columbia River, and it is the principal ocean port of Oregon, being located in the center of or adjacent to the vastest forest region and the most fertile valleys.

The Coos jetty has a history far more inviting than that of any other on the Pacific Coast. When its construction was commenced in 1879, there were only 10 feet of water on the bar. The first project called for 1,760 feet of jetty, which was speedily built, at a cost of only $213,750. As the channel still continued movable, tortuous and unstable, Congress in 1890 ordered the north jetty continued to a length of 9,600 feet and the construction of a south jetty 4,200 feet long. The extension of the north jetty was completed in twelve years, at a cost of only $721,720, of which $196,721 was for maintenance. The channel deepened naturally and became stable, so that it was not necessary to construct the south jetty. Deducting maintenance, it will be seen that the actual cost of this jetty was only $77 per foot. After a lapse of ten years, the condition of the jetty is practically normal. Its enrockment has only slightly subsided. Its tramway and receiving wharf only have been destroyed, the result of the work of the teredo and consequent decay.

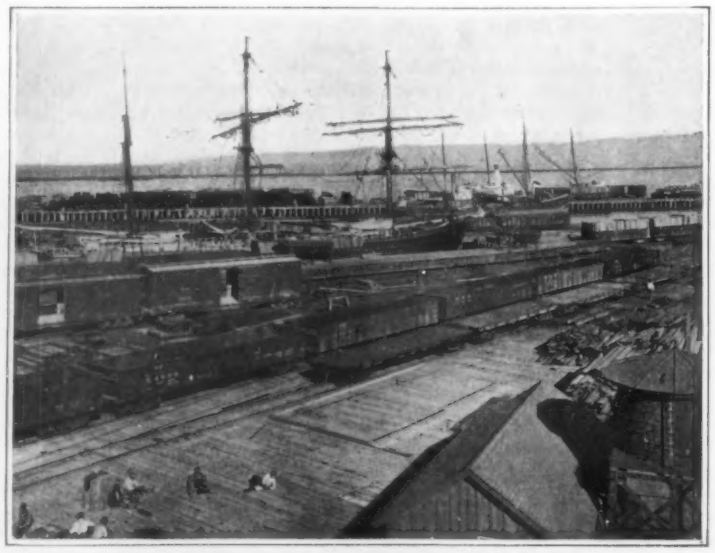


Lake Washington canal, Seattle, showing the cofferdam and lock-pit.



Vessels of the Pacific grain fleet in Portland, Oregon, harbor.

Filling in the shallows at Los Angeles harbor.



Typical shipping scene at Long Wharf, Oakland, Cal.

State of Washington.

TACOMA HARBOR.—Tacoma has one of the deepest harbors extant, ranging from 200 to 600 feet in depth. At the south end of the harbor are extensive tidal flats, bare at low water. The city water front is along the southwestern shore and the harbor lines have been established around the south end of the bay and along its western side. Several waterways extending into the flats have been projected, of which the most important, the City Waterway, has been completed at a cost of $162,480. Its depth varies from 25 feet to 15 feet at its south end. Tacoma's great harbor problem remains unsolved, and has languished for three years. This project called for the deepening to 28 feet of the Puyallup waterway for a width of 500 feet and a length of 3,650 feet. When one half of the work was completed, at a cost of $159,585, freshets brought down such large deposits in November, 1909, that the 1,811,599 cubic yards dredged were replaced by more than 1,000,000 cubic yards of debris. All work was then stopped and the channel has since refilled. A board of government engineers decided, after a survey, that the only solution of the problem was to divert the bed of the Puyallup River and have it empty elsewhere than into the waterway of that name. As such diversion is not comprehended in the scope of Government operations, it will never be done unless private, city or State interests do it. Meantime, Tacoma is going ahead with its wharf terminals on an extensive scale, leaving the Puyallup for later consideration.

GRAYS HARBOR.—Grays Harbor is the name of a top-shaped bay fourteen by seventeen miles in area, forming the mouth of the Chehalis River. On it are located the thriving sawmill cities of Aberdeen, Hoquiam, Cosmopolis and others, which contribute about 800,000 tons annually, mostly of lumber products, to commerce. Here the usual jetty problem was encountered at the outset, a convex bar having primevally formed two miles out at sea, across a channel about 100 feet deep, diminishing landwards to 30 feet. The two

entrances through the bar had 12 to 13 feet of water, periodically shifting. In 1896 Congress authorized a south jetty three and a half miles long to control the tidal currents existing between two sandy peninsulas, 12,500 feet distant from each other. In 1902, when the $1,000,000 authorized for the work had been expended and 13,734 feet of rubble-stone jetty completed, further work on it was abandoned. In 1907 Congress authorized a north jetty of 9,000 feet length, and, in 1910, its extension to 16,000 feet, to bring up its outer end opposite of the end of the south jetty. Local interests contributed the land for the trestle approach and operating plant. The jetty trestle is at present 12,784 feet long and the enrockment finished up to 9,376 feet, 8 feet wide at the crest, to the mid-tide level. Nature offers no such tremendous opposition and difficulties here as at the mouth of the Columbia River; but, for that matter, it is doubtful if the latter has any rival extant for battering and destructive powers.

SEATTLE'S engineering problems do not call for much comment. The harbor works concern two fresh-water lakes, Union, within the city, and Washington, on its borders. A navigable connection with Puget Sound is proposed for the former, and the improvement of the Black and Duwamish rivers forming the connection of the latter. A channel has been dredged, 50 feet wide and 16 feet deep, between the Sound and the wharves at Ballard, in Salmon Bay, a distance of 2,000 feet, with a turning basin 175 to 500 feet wide. A cut has been excavated between Lake Union and Salmon Bay to control the water level of the former. From Ballard to the lock site the channel is 75 feet wide and 16 feet deep. In June, 1910, Congress authorized the construction of double locks to be located at the entrance to Salmon Bay, and an unbroken channel-way therefrom, through Salmon Bay and Lake Union to Lake Washington. The channel, or canal, is to lower Lake Washington to the level of Lake Union. The cost estimate was $3,555,000, of which Congress appropriated $2,500,000, for the locks and accessories only, Seattle agreeing to pay for the channel work and to secure the government from all damages for lowering Lake Washington or raising the level of Salmon Bay.

California.

SAN DIEGO.—San Diego's bar was originally cut by a natural channel 500 feet wide and 21 feet deep at mean low water. In 1875 Congress appropriated $80,000, with which a dike was thrown across the mouth of the San Diego River for the purpose of preventing its deposits from injuring the harbor. In 1890 Congress authorized the construction of a 7,500-foot jetty on Zuninga Shoal, at the harbor entrance, and the maintenance of a channel 24 feet deep. When this project was completed, the channel first deepened from 26 to 28 feet, then subsided to 24 feet. Continued dredging increased the maximum depth to 27 feet. The average tide here is 4.8 feet, as against 18 feet in the Pacific Northwest. In 1910, Congress authorized a channel 30 feet deep at the outer bar and 600 feet wide, so as to admit the Pacific squadron and enable the warships to coal at La Playa. This work will be completed by the time of the opening of the Panama Canal and the Panama-California Exposition at San Diego in 1915. The harbor has an area of twenty-two square miles, ceded to the city by the State. The city has appropriated $1,000,000 for a modern wharf system, with wharves 1,000 feet in length each and an additional sea wall 25,000 feet long. There are still 1,000 acres which can be utilized for commerce. A belt line railway is being built along the entire water front to facilitate the movement of freight.

LOS ANGELES.—Los Angeles harbor was created by the annexation of San Pedro's outer and Wilmington's inner harbors. Originally San Pedro Bay was an open roadstead, protected on the west by a bluff known as Point Fermin, but exposed from other directions. In 1897 Congress made available $2,900,000 to build a breakwater from Point Fermin 8,500 feet out into the Pacific Ocean. The fund was sufficient to extend the breakwater 9,250 feet from Deadman's Island, to terminate in 40 feet of water. This portion of the work consists of two straight arms, connected by a curve 1,800 feet long, having a radius of 1,910 feet. The westerly arm is 3,000 feet long, the easterly arm 4,450 feet long. Deadman's Island has been connected with the mainland by continuing the breakwater to 11,275 feet in length. The breakwater is 122 to 194 feet wide at the base, 38 feet wide at low water and 20 feet wide on top, 14 feet above low water. This breakwater can only be described as one of the greatest extant, creating, as it does, a magnificent roadstead out in the ocean. To construct it 2,563,777 long tons of rock were used, with rocks weighing three tons each and upward.

On invitation, Mr. Irving T. Bush, projector of the Bush Terminals of Brooklyn, has inspected Los Angeles' harbors with a view of suggesting how they can be made to anticipate the further increase of trade to result from the opening of the Panama Canal. He recommends the construction of a wharf three-quarters of a mile long. Such a wharf would be 2,960 feet longer than any now extant. The city has now twenty-two miles of improved water front.

SAN FRANCISCO.—San Francisco has the great advantage that it is a practically natural harbor. The Government has never had to concern itself in its behalf, except to remove rocks, which mostly projected above water, where they could always be seen and avoided. This natural harbor is forty miles long and from three to ten miles wide, with thirty-six square miles of anchorage area, ranging from 40 to 90 feet in depth. Its main entrance, Bonita Channel, has a permanent, unshifting depth of 48 feet, which never has and probably never will require a dredge. It has other channel entrances also, none of which have less than 30 feet of depth. The only impediments to navigation were the rocks mentioned, marked with buoys or lighthouses. Of these, Blossom, Arch and Shag rocks Nos. 1 and 2 have been removed to a depth of 30 feet, and also Noonday rock, thirty-three miles west of the entrance. Work was stopped on Rincon rock at a depth of 24 feet, when the city took the base over for a wharf and included it in the pier-head line. In 1910 Congress authorized a depth of 40 feet of water to replace Centissima rock, in Bonita Channel, and 35 feet of water in the place of two rocks near Mail Dock. In this work $515,928 have been spent and $250,000 more have been authorized. It is evident that San Francisco harbor must remain the only one on the Pacific Coast, for many years, that can admit the largest of the world's vessels.

OAKLAND.—Oakland commenced harbor building in 1874, and work has been done intermittently ever since. It is now a greater harbor than it has commerce for, and speculation is rife as to what benefits will accrue from its future enlargement. As it is, 64 per cent of its tonnage goes on ferry transfers across the bay, consisting of overland freight consigned to San Francisco. The harbor is essentially the San Antonio estuary, an arm of San Francisco Bay. The project of 1874 resulted in the construction of two high-tide training walls at the entrance, a tidal canal one and a half miles long and 400 feet wide, connecting with San Leandro Bay, a tidal basin with a channel to San Francisco Bay and three steel bridges across the tidal canal. Next, a number of channels were excavated into Oakland and the jetty was extended 500 feet. Since then canals and waterways have been deepened, the main channel to 30 feet and the widening processes have been continued up to 500 feet. Today the tidal canal has been extended to four and three quarter miles in length, the channel around the tidal basin to two and three eighth miles and the channel in the tidal canal to two and one quarter miles. Congress has authorized further improvements to the extent of an additional $705,482, and has appropriated $150,000 of it to be spent this year.

City Planning Congress at Duesseldorf, Germany, 1912.

DUESSELDORF, the most beautiful and modern city in western Germany, known as the "Park City" and the center of the industrial empire with its extraordinary commercial and political developments, probably without a rival throughout Europe, is at present holding an exhibition on city planning, city operation and city administration functions.

The exhibition will last from June 29th to October 31st, while the International Congress will be from the 23d to the 28th of September.

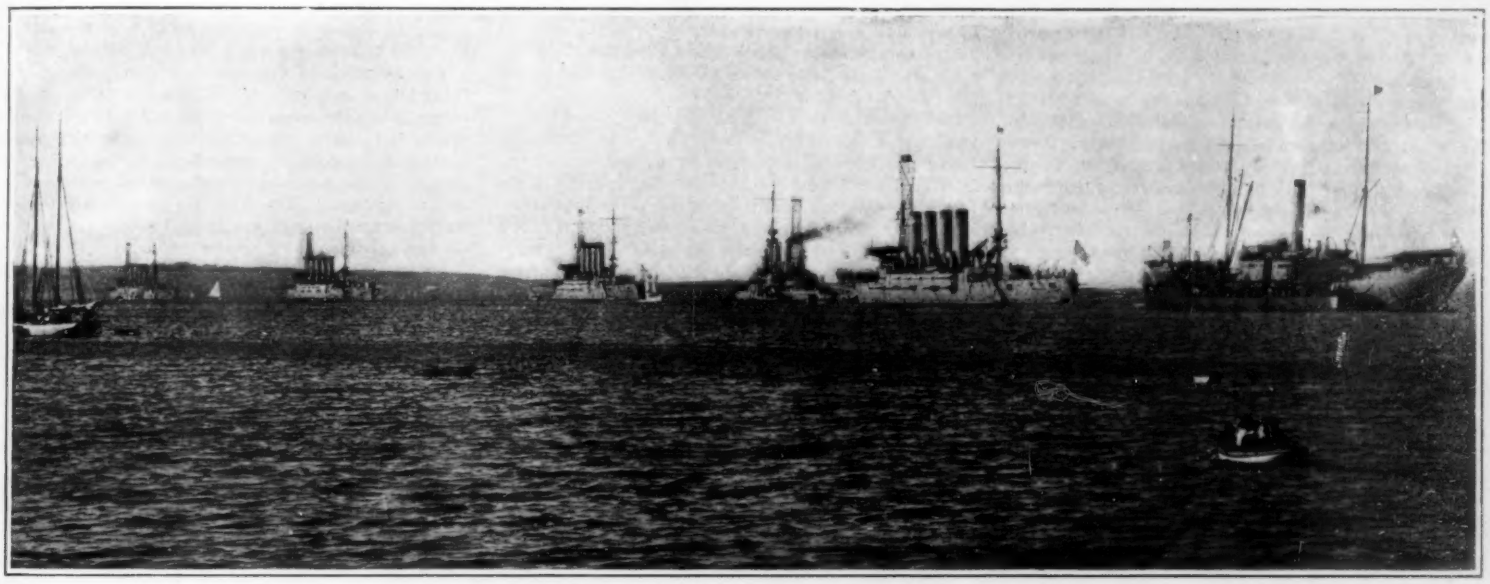
The first group of exhibitions consists of general ground plans, traffic systems, such as railways, local and express facilities, elevated, subway, suspension and street railways, aviation stations, city embellishment, bridges, docks, parks, lawns, forests and real estate politics.

Under city operation are grouped: Gas works, water works, electric central stations, sewage systems, street cleaning, refuse disposal, cemeteries and crematories.

Under the third group, administrative functions, are exhibited plans and models of hospitals, rescue homes, poor houses, lodging houses, orphan asylums, homes for widows and the aged and infirm, schools, churches, museums, art galleries, libraries, concert halls, etc.

It will be noticed from the foregoing items that this exhibition is planned with the well-known German thoroughness so that hardly any subject is omitted that is of importance in city planning, city operation and administration.

The addresses and papers will be read in the principal languages, German, English, French, etc.



The Pacific squadron assembled in San Diego harbor.

Lieut. Scott Wins the Bomb Prize.

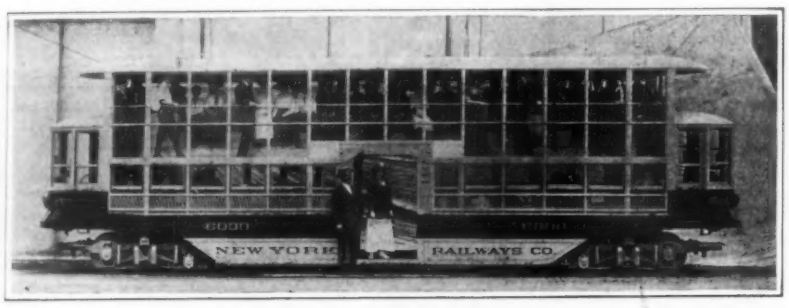
THE trials for the $5,000 Michelin prize for bomb dropping from an aeroplane at a height of 2,400 feet ended at Châlons on August 11th in an American victory, subject to confirmation by the French Aero Club. The winner was Lieut. Scott of the United States Army. Scott dropped the bombs three at a time. The first three fell outside the target, which was a rectangular space 170 by 40 feet. Subsequently Scott succeeded in dropping eight projectiles within the target. Readers of the SCIENTIFIC AMERICAN will doubtless recall a very interesting article that Lieut. Scott wrote for us about a year ago on his method of dropping bombs.

New York's Double Deck Car

LAST spring there was introduced in the streets of New York a peculiar low street car, which gained for itself the name of the "hobble-skirt" car or the "stepless" car for the reason that it was hung very low, and hence required no step between the street level and the floor of the car. This result was obtained by placing the driving motors at the end of the car and the car body between them. The entrance to the car was at the center.

When it was found that the low stepless car was a success, it was only logical for the next improvement to consist of an upper story placed over the low car. By an ingenious disposition of the various parts a double deck car has been evolved which is only seventeen inches higher than the ordinary car that runs up and down Broadway. At each end of the car are the stairways that lead to the upper deck. Here there are two long seats running the entire length of the car, and arranged back to back. Thus the aisles of the upper deck are at the outside, whereas the aisle of the lower deck is in the center, where there is plenty of head room directly under the seats of the upper deck. The seating capacity of the new car is 88 passengers, and there is standing room for about 80 more. The seating capacity of the long open cars now in use is 60, and of the short ones, 50. While the long closed car will seat but 36 and the short ones but 28. The pay-as-you-enter-car has room for 41 to 47 seated, and the single deck stepless car has seats for 51.

Stairway to upper deck.



New York's new double-deck car. Only 17 inches higher than the ordinary car.

While the double deck car is a decided innovation in this country, it has long been in use in Europe. However, the design is decidedly different; in our car the stairways are placed at the side and are entirely enclosed, so that the passengers need experience no timidity about climbing from one deck to the other. In mounting from the lower to the upper deck the passengers have to rise less than two feet more than they would in boarding an ordinary car. The upper deck of the car is roofed in, but the sides are open, except for a protective netting. In the winter time this will be replaced with solid panels and windows. The car is now being tested to determine whether it can be unloaded and loaded rapidly enough, particularly from the upper deck. As the only exit and entrance to the car is at the center there may be some difficulty from congestion at this point. If it is found that the car may be readily unloaded and loaded there is no doubt that many cars will be ordered for use on the crowded streets of New York. Thus, in economizing in the number of cars operated, there will be a material economy in operating expenses, and added to this there will be less congestion of the streets, and consequently a more rapid transit.

East African Cedar for Lead Pencils

THERE are about twenty lead pencil factories in and around Nuremberg, Germany, which consume approximately 100,000 tons of cedar wood annually. All of the lead pencil factories in Germany excepting one small concern at Regensburg are located at Nuremberg. For 250 years the operators of these factories have been dependent on America for their supply of pencil cedar, which includes the northern red cedar (*Juniperus virginiana*) and the southern red cedar (*Juniperus barbadensis*). Suitable woods from other sources have been sought for a number of years, but none have ever been found that were so satisfactory, or that approached in quantity and quality the cedars of the eastern and southeastern United States. It has recently been announced, however, that this dependence on the American product is almost at an end, since the extensive Schume forests of cedar (*Juniperus procera*) in German East Africa are being exploited. These forests are said to furnish a wood equal in quality to the average grades of the American cedars and sufficient in quantity to satisfy the needs of the German factories for a good many years to come.

The German government had an investigation made of these forests with a view to developing them and to render the timber supply available for use. It did not lose an opportunity to make known this large supply of cedar wood, and a concession has recently been granted to a company for the exploitation of this valuable timber. The company has constructed a cable-tram line at a cost of nearly $400,000, for the purpose of bringing the logs to the mills. It is the steepest cable-tram line in the world, and is said to be a masterpiece of engineering skill. The line is now being successfully operated, and the cedar logs are converted into lumber and transported by rail to the port of Tanga, in Usambara. From here it is shipped by the steamers of the East African Line to Hamburg—the principal distributing point.

Many government officers have tested the lead pencils made from this African cedar and have approved them; the Prussian ministries of finance and of the interior both have recommended that pencils made from East African cedar should be given preference. Practically all the leading German lead pencil factories are now using some African wood, and the pencils made from it are pronounced to be equal to those made from the American cedar.

Water-skating

ATTEMPTS have often been made to design some means for enabling man to walk on the surface of water, and especially during the last few years a number of "water-skates" have been invented for the purpose. However, all these designs showed the drawback of possessing a weight much too high, their dimensions were too great and transport too inconvenient and difficult over land to allow any pleasurable sport. In fact, the prospects of this fascinating water pastime were anything but promising.

However, on the Lake of Gross-Wusterwitz, in the Prussian Province of Saxony, water skaters moving with surprising agility have now made their appearance in great numbers. They use a novel type of non-rigid water skate constructed by the Deutsche Wasserlaufschuh-Werke, which may be said to eliminate all the drawbacks so far inherent in this mode of locomotion. These compressed air water-skates which embody the results of many years' studies and indefatigable experimenting, look very much like skis, have strikingly low weight and small dimensions, and accordingly allow the skater to glide on the water with an extreme ease. While in ordinary rowing one has to turn his back to the direction of motion, water skating has the additional advantage of allowing the face to be turned forward, so that the eye on account of the erect position can sweep freely over a wide expanse of water. A further advantage of the new water-skates, which on account of their low weight are readily transportable, is the possibility of folding them up into a small and extremely handy bundle, after allowing the compressed air to escape from the floats (consisting of pointed caoutchouc cylinders and rubber-coated sail-cloth covers). They are pumped up again and mounted for use with the same rapidity and ease.

At the underside of the water-skates are attached movable fins which by opening at every move, enable the skater to slide on with the utmost facility. Another possibility which affords additional variety is to use alternately or simultaneously with the work of the legs, a light paddle endowing the skater with a mobility attained by no water craft. Everywhere, even on the most frequented waters, will the skater be able swiftly to make his way through the crowd of ships and boats.

Water-skating in this new form seems to be anything but a dangerous sport. The feeling of absolute safety which is experienced by the users of water-skates is based in their very construction: The keel running underneath the water-skate (and tied up to the latter) insures a very sufficient stability, excluding any risk of tumbling. In fact, no fall or other accident has so far occurred on any one of the numerous trips made on water-skates nor in connection with the exercises of beginners even in rough water. However, provision has been made even for the remote possibility of an accident. In order not to be hindered in swimming the skater is, in fact, able with a single move to free his feet from the water-skates. The only back motion of the locking lever required in this connection is effected without difficulty and with an absolute safety in any position whatever. A safety device prevents any involuntary detachment.

Water-skates folded up for easy transport.

Gliding on the water may be assisted by a light paddle.

German and French Airship Rivalry

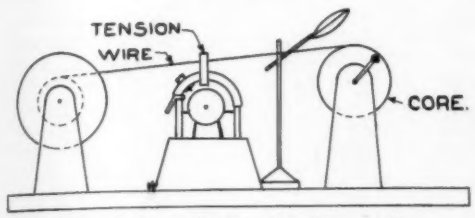
THE fact that one of the Berlin papers stated that Germany now had as many as 27 balloon sheds for airships, led the Paris daily *Le Matin* to resume the question of relative strength of these rival countries. Germany is laying great stress on the airship question and appears to prefer the airship as being best suited to the national character. The 27 airship hangars appear to lie mostly on the frontiers of the country, headed by the great Friedrichshafen hangar which takes two Zeppelins, then come Hamburg, Frankfort, Metz, and others. New hangars are planned at Wilhelmshafen for large marine airships gaging 25,000 cubic yards. It is difficult to say just how many military airships Germany possesses, for these are often transformed and their names changed, but there are probably not more than ten or a dozen fit for use. France has nearly the same number at present, and there will soon be three new airships finished. As to the hangars, there are 8 on the east frontier and many others in the Paris region or elsewhere which make about 20 in all. The position of the two countries is about equal as to the number of airships and hangars. Germany is spending large sums in this direction, and this is not the case in France, for the most of the attention is given to aeroplanes.

A Simple Wire-winding Apparatus

By Norman Barden

WHEN the amateur experimenter starts to building coils, the winding of the wire generally looks like a great task to him; and so it is when the wire to be wound is small and hundreds of feet are to be coiled. It so happened that the writer was interested in the making of a large ozone generator which had to be finished in a very short time. The secondary was to consist of 10,000 feet of No. 40 enameled wire. How to wind the wire in a short time without breaking it or having any laps in the winding was the problem.

The driving mechanism of an old model Edison phonograph was brought into use, and made to guide the wire and at the same time to keep it taut. This was done in the following manner: A tension was fastened to the bridge that carries the needle. The



Wire-winder made out of a phonograph.

machine was placed so that the tension was about three inches from the core, which had been put between centers as shown in the accompanying figure. The speed of the machine was then slowed down so that the core could be turned about seven times while the tension moved to the right a distance of one fiftieth of an inch, i. e., while the record cylinder made one revolution. In this way the wire was wound on the core, which was three inches in diameter, in one afternoon. A magnifying glass was used as shown in the figure to assist in watching for any kinks in the wire.

It was surprising to find how well the work could be accomplished when one person turned the core and another regulated the speed of the machine and watched for any trouble in the winding. With this arrangement, as soon as anything went wrong, the one turning the core would immediately stop, and the other person would drop a little paraffin on the wire on the core to prevent it from becoming loose. A part of the wire could then be unwound and the trouble fixed with no fear that the rest of the winding would be loosened. It was also found necessary to have the distance between the core and wire reel as short as possible. The shorter this distance the less danger there is of the wire's breaking. This last applies especially to the winding of the finer wires. Two other factors are to be taken into consideration. These are that the reel must turn very smoothly and easily, and that the winding must be done evenly and not by jerks.

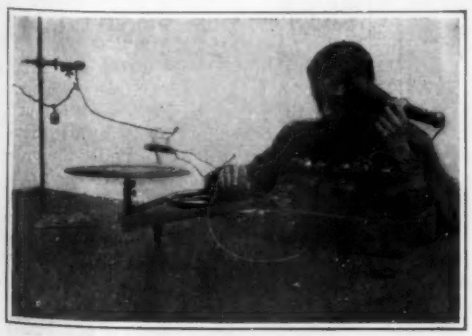
A Simple Microphone and Reproducer

By C. C. Kiplinger

HEREWITH illustrated is a simple microphone and also a rather unusual application of this interesting instrument. It comprises two short lengths of ¾-inch electric light carbon. These are inserted in each end of a bit of ¾-inch rubber tubing.

The ends of the carbon rods within the tube should be about ½ inch apart. This space is loosely filled with granular carbon free from dust, obtained by crushing arc-light carbons in a mortar. The granules should not be more than one thirty-second inch in diameter. The pressure on the particles may be varied by shifting one of the rods.

Copper wires are twisted tightly about each rod to



The microphone reproducer in use.

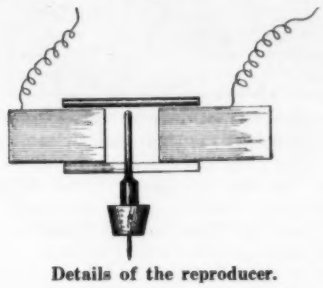
serve as connectors. If the carbons are copper-plated the wires should be soldered to the plating.

The instrument is connected in series with a telephone receiver and a battery of a half dozen cells. When the microphone is properly adjusted, a very small disturbance of the carbons will cause a corresponding movement of the carbon granules, and the resistance offered to the current will change. This causes a sound in the receiver. A cigar box provides a good sounding board for the apparatus.

With a slight modification, this device becomes a first-class reproducer for a gramaphone. The sound waves engraved on the record may produce electrical vibrations, which in turn, are reconverted by the telephone receiver into sound waves in air. A loud-speaking receiver will make these audible to a large audience.

A small slit is cut in the center of one side of the rubber connector. A short piece of three sixteenths inch brass tubing is flattened for a part of its length by hammering, and the flattened end passed through the slit so that it just clears the opposite side of the cavity. The flat surfaces of the tube should be parallel to the ends of the carbons. A small cork and needle are attached to the other end of the tube, as shown in the sketch.

The photograph shows the apparatus in working order. It is supported by a stand, a heavy wire, and a counterbalance of some sort. The connecting wires should be very flexible, so as to offer little resistance to the motion of the microphone. The sound waves inscribed on the record are transmitted to the carbon granules by the needle and brass tube. The receiver



Details of the reproducer.

may be at a distance from the reproducing microphone.

Very interesting results are obtained by changing the angle of the needle with reference to the disk, so that the record may be run in the opposite direction. The vibrations are reversed in order, as are the vocal inflections, producing in many instances extremely ludicrous effects.

Etching Glass With Hydrofluoric Acid

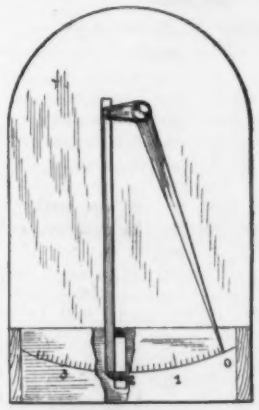
By Norman Barden

IT is sometimes desired to etch a small design in a piece of glass or a label on a bottle. To do this on small pieces of glass, not larger than twelve inches square, does not require a great deal of expensive material if done in the following manner: The glass piece to be etched is first covered with a thin layer of paraffin wax or beeswax. The design to be etched is drawn on a piece of glazed paper with a soft pencil. The drawing is now placed against the wax coating and is rubbed all over the back with some blunt instrument. On removing the drawing, the design will be clearly seen on the wax surface. The design is now cut in the wax, i. e., wherever the glass is to be etched, it is cut free from wax. Now, as to the etching, this can be done in two ways. The first method to be described is very convenient for etching small designs and graduation marks, as on thermometers and special graduates. A tuft of cotton is fastened to the end of a piece of copper wire. With this, hydrofluoric acid is swabbed over the design until it is etched the proper depth. The operation must be carried out in a well-ventilated place or in a slight draft. The fumes of the acid should never be breathed, and the acid itself produces severe burns if it touches the skin. Commercial hydrofluoric acid is obtained in paraffin-lined bottles, and must be kept in these containers or in gutta-percha flasks. For the larger pieces of glass to be etched, it will be found best to do them in the following manner: Finely crushed calcium fluoride or fluorspar is sprinkled over the bottom of a shallow lead tray. A lead tray can be easily made from sheet lead by bending the edges up to form the tray sides. Over the fluorspar is poured concentrated sulphuric acid. The spar does not have to be entirely covered by the acid. After the design has been prepared the glass plate is laid, face down, on the lead tray. It is best to have both sides of the plate covered with the wax when the etching is done, in the following manner: To etch the glass, apply gentle heat to the pan. This may be done with a spirit lamp or the Bunsen flame. This operation should be carried out in the open or under a hood in connection with a chimney or an exhaust fan. The etching in this last case is done by the hydrofluoric acid vapors that arise from the heated fluorspar and sulphuric acid. The one great caution in etching glass is not to inhale any of the acid fumes and never let the least bit of the acid come in contact with the skin.

A Home-made Hygrometer

By C. S. Meeker

THE accompanying engraving illustrates a home-made hygrometer constructed by the writer more than thirty years ago. The instrument worked well for twenty-five years when it was accidentally broken. The instrument consists of a baseboard upon which is mounted a pointer cut from sheet metal. The pointer is ten inches long and is provided with a lateral arm



Hygrometer with wooden expansion member.

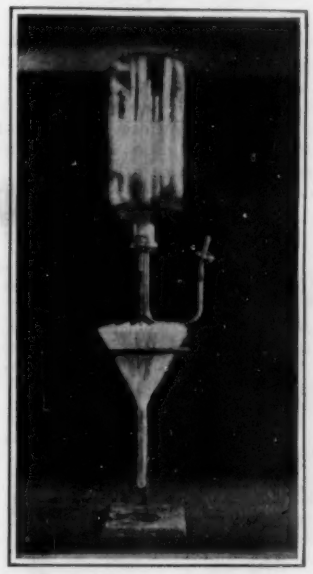
at the pivot end one inch in length. The end of the pointer passes over a scale at the bottom of the baseboard, graduated in tenths of inches. The short arm of the pointer is fastened to a piece of clear soft pine, ½ inch square, cut with the grain running crosswise. The lower end of this pine stick is fastened to a stud which passes through a slot in the baseboard and is adjustable therein to bring the pointer to the zero mark on the scale. The pine stick was dried in a kiln and after being taken out was allowed to cool, when it was set at such an adjustment as to bring the pointer to zero on the scale. An expansion of one 0.01 inch in the wood would cause the pointer to move 0.1 inch. The instrument was placed in a shed where neither rain nor sun could reach it. On several occasions the pointer stood at zero and at one time it reached as high as two and two-tenth inches, showing, therefore, an actual variation in the length of the stick of over a fifth of an inch between the dry and damp weather. The device was not made as a hygrometer, but was constructed primarily with a view to ascertaining the expansion and contraction of timber.

Improved System of Filtering

By Clarke E. Davis

THE large inverted bottle shown in the cut is fitted with a two-holed rubber stopper, through one hole of which passes a short glass tube extending upward just through the cork and downward to the funnel. In the other hole is inserted a glass tube, which reaches to the bottom of the bottle and terminates at the other end in a piece of rubber tubing fitted with a clamp.

This clamp serves to regulate the inflow of air,



Filter with regulated air flow.

which controls the outflow of the liquid. The funnel is supplied with an ordinary plaited filter.

This system of filtering is advantageous because it may be started and it will take care of itself to completion, thus enabling one to filter the various precipitated reagents, etc., while conducting a session or enjoying a meal.

Inventions New and Interesting

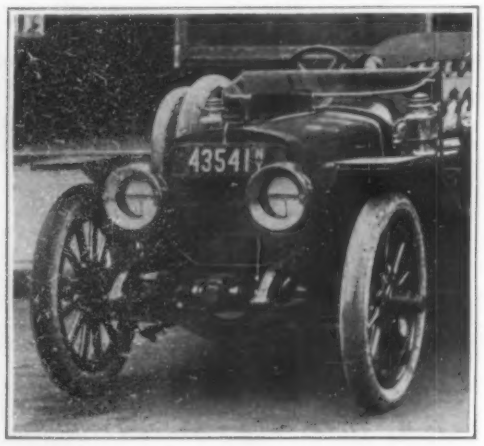
Simple Patent Law; Patent Office News; Notes on Trademarks

Self-starter Device for Automobile Engines

By Theodore M. R. von Kéler

THE difficulty of starting a powerful automobile engine on a cold day by means of an ordinary hand crank has been brought home with considerable force to those owners or drivers of high-powered cars who operated their cars before the arrival of the various systems of self-starters which now are on the market. And even now, despite the presence of several systems of starting devices, the difficulty is by no means fully solved, for even the most perfect ignition, piston pressure or electric device made, will balk occasionally. Any invention, therefore, which promises to do away with at least some of the troublesome difficulties encountered, deserves careful investigation.

Differing radically from every other motor starting device so far brought on the market, the Air Starter contains features which never before have been brought to a practical test, but which appear so logically correct that one cannot refuse them due consideration. The device, which is manufactured by a Detroit company, recently was exhibited in New York city streets, attached to a sixty horse-power, four-cylinder touring car. In several hundred demonstrations the apparatus worked without a hitch.



The position of the air starter supported on the springs in front.

The device consists of a small two-cylinder opposed air compressor, a compressed air tank and the air crank. This last named part of the invention is the most radical departure from accepted designs of compressed air starters. Instead of forcing compressed air or exhaust gas into the tops of the cylinders themselves, and forcing the pistons down by this means, the air crank simply replaces the human arm on the crank handle and turns the crank by means of a mechanical arm. How this is accomplished is clearly visible in the accompanying diagram.

The air crank consists of a semi-circular cylinder in which a piston is free to move in an arc of about 160 degrees. The piston is firmly attached to the crankshaft by means of a cranking arm fitted with a rachet device. When compressed air from the tank is admitted into the cylinder—which is accomplished by simply pressing a button on the foot board—the piston is pushed around with great speed and power until the cranking arm hits the bumper, which movement is equal to turning the engine over two or three compressions. As soon as the bumper is touched the rachet device is disengaged and the long helical spring returns the cranking arm and piston to their original positions. In case of a back fire before the arm has reached the end of its turn, the ratchet is also disengaged by contact with a tripping pin acting as an automatic release, and the crank arm returns to its normal position.

In addition to cranking the motor the compressed air tank is arranged so as to accomplish other work around the car. A hose valve on the dash, and a length of flexible hose with a tire gage for filling the tires, dusting the car, etc., are provided. An air signal can be connected, powerful emergency air brakes attached, constant pressure supplied for the gasoline tank, etc. By simply pressing a foot button when the car is running, the driver can connect the compressor at will. It is claimed that operating the compressor for about five minutes two or three times a week is sufficient to maintain a pressure of 250 pounds in the storage tank. An air gage on the dash indicates the pressure.

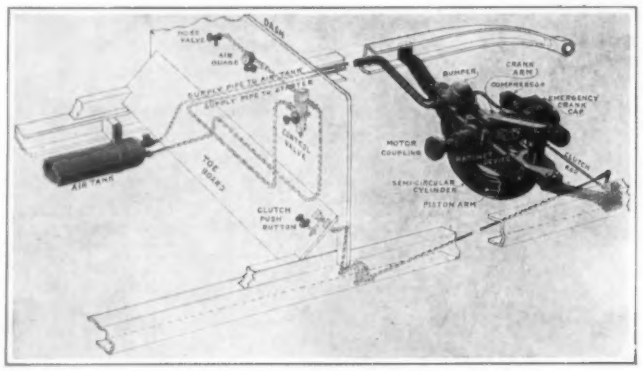


Diagram of installation of air starter device, showing connections between air crank at the right and air tank push button.

A Tractor Steering Device

THE growing use of tractors and the scarcity of reliable trained help has led to the invention of a substantial device that automatically guides a tractor in plowing or in breaking and does it even better than the average man can do it. At the same time it makes it possible for one man to operate both engine and plows. The tractioneer can give the proper attention to the motor of his tractor while traveling forward or in superintending the work of his plows, as the occasion requires, and the tractor equipped with such a guide turns straight furrows of equal width.

The guide is made of high carbon channel steel securely braced and bolted together. The principal factors are two ¼-inch × 5½-inch × 4-inch channel steel beams, 13 and 14 feet long, respectively, bolted to each other by brace rods of the same size material, so as to form a triangular frame.

At the front end of this triangular frame is a single wheel and a long steel shoe. The wheel runs in the previously turned furrow—hugging the "landside"—and by the leverage it exerts on the axle, keeps the front wheels in line. The distance from the tractor to the furrow is easily regulated by a simple adjustment of two arms on the angular frame.

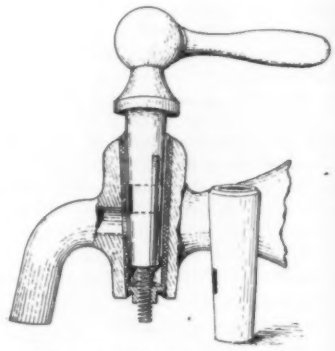
The shoe at the front end of the frame affords protection against any accident to the guide should the wheel drop in a hole or strike an obstruction. It also keeps the device free from weeds and other trash. If the guide should strike a hummock, there is no chance of it doubling up, because the shoe will assume the burden and hold it until the wheel once more has smooth footing. The front wheels are held firm, that is, kept from see-sawing.

This device does not interfere with the backing of the engine, and in turning, it describes a circle only four feet greater in radius than the front wheels. In attaching the guide to the engine, the steering chains are detached from the front axle and connected up with the cables on the steering device, which, in turn, are held in alignment by two cable guides. The guide wheel may be offset any desired distance, the amount depending upon the number of plows and the size of the bottoms used. When the end of the field is reached the turning is done in the usual way by the steering wheel of the tractor.

The steering wheel of the tractor is in front of the frame and runs in a previously turned furrow.

Plug Cock With Removable Sleeve

A PLUG cock or faucet is much more desirable than a compression cock or screw faucet because it is cheaper to produce and is quick acting; for a quarter turn or less of the lever of the plug cock will wholly shut off the flow, or open it to full flow, whereas with a compression cock, several turns are necessary. However, the objection to a plug cock is that they are not durable and are apt to leak. Furthermore, the repair of a plug cock is rather expensive. Trouble usually manifests itself in wear of the edges of the ports and the only way of repairing the damage is to replace the worn off plug with a new one. In order to reduce this item of expense and provide a ready means of repairing a worn off plug cock an inventor has recently designed a cock having a removable sleeve on the plug. When the ports through this sleeve become badly worn it is a simple matter to remove the plug from the cock and replace the worn sleeve with a new one. The details of the invention are shown in the accompanying cut. A key on the body of the plug fits a keyway in the sleeve and insures proper register of the ports in the sleeve with those in the plug. The plug is held in place on the cock by means of a nut bearing against a split-ring washer, not shown in our engraving.



Plug cock with removable sleeve.

An Improved Ship Construction

ON June 11th, 1912, there was issued a patent, No. 1,029,546, to Joseph William Isherwood of Middlesbrough, England, which, it is claimed, will revolutionize the building of vessels. The invention relates largely to the framework of the vessel and seeks to so distribute the metal of the framework of a ship as to cause the skin and deck plating of the ship to form an essential part of the bracing structure, making this said plating do work or resist strains which ordinarily would be resisted by the framework only.

From this, it is asserted that considering ships of equal strength and seaworthiness, of say three hundred feet long, it is found they can be built with about five hundred tons less metal than under the ordinary construction, effecting a saving in cost of say thirty thousand dollars. The particular method of construction consists in making the transverse frames and beams a plurality of times stronger and spacing them a plurality of times farther apart than has heretofore been customary in the same type of vessel, and also in making said frames and beams of a less total weight in metal than has heretofore been customary. The particular feature upon which patentability rests seems to consist in the discovery that the complex twisting, racking and breaking strains to which a ship is subjected in a seaway, and which defy calcula-

tion, will be efficiently resisted by this particular disposition and saving of metal.

Although it has only been, say, about three years or a little over since the first vessel went to sea under this system, yet to-day it is claimed there have been built or are now building over two hundred large vessels using the method, aggregating in cost upward of sixty millions of dollars. Also that a very large number of vessels has been built or are now being built in the United States under this system and that only recently the navy has had completed two colliers constructed according to this invention.

The Trade-mark as a Business Asset

By W. E. Woodward

[THE average business man has only the vaguest notion of the value of a trade-mark. He does not realize that it is very often the connecting link between the producer and the ultimate consumer; that it is a symbol of good will, a tangible asset with a determinable money value; that it must be chosen and applied not in a haphazard way but with a due regard for its psychological effect upon the public. Nor does he realize the importance of complying with the statutory requirements which secure to him a property right in a trade-mark comparable with the property right that an inventor acquires by taking out a patent.

The following is the seventh of a series of articles, written by a man who is at once a trade-mark, an advertising, and a business expert, a man who has a first hand knowledge of the value of trade-marks and of the correct methods of trade-mark exploitation. The series, which will be eventually published in book form, will include discussions, written in business English, of the Federal trade-mark law, analyses of the requirements for registration, the elements of a good trade-mark, and trade-mark protection.—EDITOR.]

The Elements of a Good Trade Mark—VII.

(*Continued from page 143, August 17th, 1912.*)

The reader who has perused the preceding articles devoted to a discussion of what a trade-mark cannot be, begins to wonder, perhaps, what part of the language is left unrestricted. It is true that the number of restrictions imposed by the law and the courts is considerable, but the language is virtually inexhaustible, with its infinite possible combination of letters and words. And to these possibilities of construction must be added the limitless varieties of designs and symbols which are registrable and valid under the law.

A trade-mark may be:

A coined word, like *Calox, Coca-Cola, Omo, Jap-a-Lac, Crisco, Pebeco, Celluloid, Plexo* (a trade-mark for suspenders; also for a toilet preparation), *Sapolio, Cravenette, Jell-O, Kodak, Uneeda, Pro-phy-pactic, Crex,* and *Quixo;* a symbol (like the Baker chocolate girl), the Prudential Insurance Company's trade-mark (which consists of a picture of the Rock of Gibraltar), the Merrimack duckling, the spear of Spearmint chewing gum, the Puritan painter (used on Bay State brick and cement coating), the Ford automobile mark (consisting of a winged pyramid), or the representation of a mask or domino (used on packages of Crystal Domino sugar), or the painter boy of the National Lead Company; a combination of word or words and a symbol (like Thomas A. Edison's portrait and signature, used in connection with phonograph), a picture of a black cat and the words "Black Cat" used as a hosiery trade-mark), the trade-mark of the Vacuum Oil Company (consisting of a picture of a gargoyle, in connection with the word "Gargoyle"), or a representation of a swan, accompanied by the word "Swan" (used on fountain pens); a portrait (like Mennen's Talcum Powder mark, which is a picture of Gerhard Mennen), or the portrait of Robert Burns (used on cigars); a word, or words used in a fanciful, non-descriptive sense (like "Cat's Paw," a trade-mark for rubber heels), "Bachelor's Friend" (a suggestive trade-mark for hosiery), the word "Ribbon" (a mark for a tooth-paste), "Republic" (used on automobile tires), "Velvet" (a trade-mark for smoking tobacco), "Onyx" (the trade-mark of a well-known brand of hosiery), "Ivory" (which stands for a famous brand of soap), "Diamond" (a name for tires), "Arrow" (used on collars), "Blue Jay" (a trade-mark for a corn plaster), "Big Ben" (used on alarm clocks), "Lifebuoy" (the name of a soap), or "Occident" (the name of a flour); an historical or a mythological character like Juno, King William, Stonewall Jackson, Cupid, Venus (a lead-pencil trade-mark), Samson (applied suggestively to a brand of rope), or Apollo (the name of a piano-player); initials or arbitrary numbers (like the "G. E." trade-mark of the General Electric Company), the number "4711" (applied to perfumery and toilet articles), "61" (a floor varnish), "O. K." (the name of a clip to hold papers together), "B. V. D." (the trade-mark of a well-known line of underwear), or the big "H" inclosed in a diamond-shaped design (used as a trade-mark on Heisey's glassware); the business name, of person, firm or corporation when written, printed, impressed, or woven in a distinctive manner, or in association with a portrait, or in an autographic form, as, for example, the name "Gillette," inclosed in a diamond and crossed by an arrow.

Marks that may be technically defective are registrable under the ten years' clause if they have been in exclusive use by the applicant for ten years preceding 1905. The word "Faultless," registered by E. Rosenfeld & Co., of Baltimore, as a trade-mark for garments, belongs to this class. "Faultless" is, of course, descriptive, but it is nevertheless registrable under the ten years' clause. Another mark of the same kind consists of the word "Coward"—a trade-mark for shoes. Coward is the proprietor, and under the act of 1905 his name has no eligibility as a trade-mark unless it is written or printed in a distinctive manner. But his name has been used as a trade-mark since 1868, and, consequently, falls within the provisions of the ten years' clause.

It is easy enough to devise a trade-mark that will comply with the letter and the spirit of the law. But a trade-mark should be something more than merely registrable and protectable. Think of the immense advertising and selling effort that must be brought to bear to overcome the inertia of a meaningless or unsuitable trade-mark.

A proposed trade-mark should not be adopted until every one of the following questions can be answered affirmatively in regard to it:

1. Is it easy to speak?
2. Is it easy to remember?
3. Is it easy to spell?
4. Is it simple in design?
5. Is it attractive in sound and appearance?
6. Is it suggestive of the good qualities of the merchandise?
7. Is it different from other trade-marks of the same class?
8. Can it be affixed to the goods with which it is to be used?
9. Is it registrable and protectable?

Competent trade-mark experts never submit a proposed trade-mark until it has passed this rigorous examination successfully. Few trade-marks in commercial use can stand these tests because most marks have been designed without any clear perspective of the part they were to play in business.

As a matter of interest and instruction, let us take several well-known trade-marks, at random, and put them through the list of test questions.

Opening a current magazine, the first trade-mark we see is "Postum," the name of a substitute for coffee. Postum is easy to say and remember and spell. It is simple, but not particularly attractive in sound. It has no suggestiveness, except the artificial suggestiveness of familiarity. It is distinctive, registrable and is virtually infringement-proof. If the figure 100 should be set down as denoting a perfect trade-mark, then Postum should be graded at about 80. It wholly lacks suggestiveness, and it is neither attractive nor displeasing.

The next mark that attracts our attention in this magazine is "Siwelclo," a coined word, applied to a flushing device used in connection with bathroom toilets. Siwelcio is not easy to pronounce; it is not euphonious; it is not easy to remember or to spell. It is the reverse of attractive in sound, and it carries no suggestiveness. It is registrable and protectable.

The next trade-mark is "O. K.," applied to paper fasteners. This mark possesses every good feature. It is suggestive in the sense that "O. K." means, in ordinary speech, "all right," "satisfactory," "good." These fasteners are used in offices. The symbol "O. K." has a distinct meaning in commercial language. We are of the opinion that "O. K." used as a trade-mark for office supplies, should be graded 100.

"Cat's Paw," a trade-mark for rubber heels, is the next. It is an example of a word that is suggestive in the wrong way. "Cat's Paw" suggests the soft quiet tread of a cat—and of rubber heels. At first glance it would seem that "Cat's Paw" is an ideal name. But those who sell rubber heels say that the noiseless tread (or "sneaky walk" as one shoemaker stated it) is the greatest of all drawbacks to the sale of rubber heels. In short, the name is suggestive, but suggests a defect.

Next we come to "Ralloc," which is the trade-mark of a collar retainer. The word is obviously the word "Collar" spelled backward. It is not euphonious or attractive, or distinctive in any way. This mark is an example of a large class of trade-marks which bear upon them the evidences of only one purpose—and that is, to produce something which will not be rejected by the Patent Office.

"Crex" is an excellent trade-mark. It is an adaptation of the word "Carex," the botanical name of a sedge-like grass which may be woven into a fabric. Dropping the "a" we have "Crex." This name sticks in the memory; it is easy to spell, easy to say, and is quite distinctive. It lacks inherent suggestiveness, but it is the kind of word that may be readily popularized by advertising.

There is a toilet preparation widely advertised and sold under the name "Sempre Giovine," meaning "always young." This trade-mark must be a tremendous drawback to the success of the article with which it is associated. It cannot be pronounced properly except by those who have taken lessons; and it is difficult to remember. To an English-speaking person it conveys no suggestion. Foreign words should be avoided in devising trade-marks. People do not like to ask for things by names which they cannot pronounce.

The trade-mark affixed to the linens sold by McCutcheon, of New York, a store famous for the quality of its fabrics, consists of the picture of an old-fashioned spinning wheel, without wording. This is a very good trade-mark. It brings up a mental picture of the slowly-wrought hand-woven linens of our grandmothers' time, fabrics that looked good and wore well.

There are trade-marks so admirably adapted to their purpose that they seem to be the work of a genius. "Uneeda"—applied to crackers in a sealed package, is such a trade-mark. "Rainbow," a trade-mark for dyes is another happy inspiration. This name makes one think of the fine colors and delicate tones of a rainbow. It stimulates the idea that these dyes emulate a rainbow in beauty. "Skidoo"—a trade-mark used in connection with a small gasoline engine for launches—is another trade-mark that touches the top notch of merit. It suggests agility and lightness, and the ability to get in motion and scurry away.

(*To be continued.*)

Notes for Inventors

Shortening a Moving Picture Film.—Patent No. 1,032,172 to Ernesto Zollinger of Turin, Italy, discloses an improvement in producing and projecting moving pictures wherein he deforms the picture on the film by reducing one of its dimensions to a fraction thereof and then projects the deformed picture through a deformer to reconstruct the projection to its normal proportions. Thus he can shorten up the picture in producing it and when he comes to project the picture on the screen he can lengthen it by suitable means to bring it back into condition to properly represent the subject he seeks to produce.

A Man Who Throws Ball to Himself.—Fred H. Wood of Elgin, N. D., has patented No. 1,030,558, a ball returning device which includes a curved tubular casing into the lower end of which a ball may be thrown, the upper end of the casing being returned slightly and a deflector plate being adjustably disposed with reference to the upper discharge end of the chute so its position can be varied in order to regulate the angle at which the ball is projected from the discharge opening.

A Domestic Dough Kneader.—In our issue of July 13th we published a brief note to the effect that somebody ought to invent a domestic dough kneader. A subscriber informs us that such an apparatus is already on the market. It consists of a twenty-quart pail having a bearing for a crank mounted on its top and a depending mixer attached to the crank. This mixer is a pointed finger, curved about one half of an arch, its lower end being about one half an inch from the bottom of the pail. We are assured that such kneaders can be obtained in almost any hardware dealer's store.

A Home-made Fly Catcher.—In one of our markets the small wholesalers have provided home-made fly catchers on a large scale. On a base board is mounted a length of fly screen-wire secured at its ends and sides to the board and elevated at the middle so the bait, usually fish heads, can be placed below the elevated portion. At one end the base wire inclines upwardly forming an entrance platform and a cover wire overlies the base one, and forms with it a chamber in which the trapped flies accumulate. The trap is simple and yet effective and attracts considerable attention in view of the campaign against the fly nuisance.

Brick Laying by Machine.—In a recent patent there is provided a machine for building up walls from superposed courses of brick with the interposition of mortar or cement between the bricks of the courses as well as between the courses. The machine has a rotatable brick carrier upon which the bricks are automatically gripped during a portion of the revolution of the carrier and from which the bricks are released when the carrier has conveyed the brick to its final position. The patent, No. 1,033,954, has been granted to Max George Shindler and Linus Paul Shindler of Hamburg, Germany.

Reducing the Noise on Street Curves.—Recently in Washington city a lady secured a judgment against a street railroad company for damage to her dress by the heavy oil used to lubricate a track curve to reduce wear and eliminate the scream-like noise when a car rounded the curve. As a result, the company stopped oiling the curve and the noise at times is almost intolerable. Some means, possibly mechanical, may be devised to overcome the friction between the wheel flange and curved rail and thus dispose of the noise nuisance and also avoid the excessive wear of wheel and rail.

A Mechanical Bow for Stringed Instruments.—A patent, No. 1,034,293, has been granted to Joseph von Peichl of Vienna, Austria, for a mechanical bowing device in which there is a movable carrier provided with rollers and a bow band traverses the the rollers and forms, with the carrier, a complete bow. Pedals are arranged for shifting the bow transversely of the strings as well as for controlling the pressure of the bow band upon the strings in order to secure the desired results.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

SHIRT.—H. SALTZMAN, 435 Jerome Ave., Brooklyn, N. Y. This improvement is in shirts provided with a plurality of lapels attached to the body adjacent the waist line thereof, to enable the shirt to be attached to the trousers and support them, thus allowing the wearer to dispense with suspenders. The shirt is made strong throughout so that it will not be readily torn in use.

Pertaining to Aviation.

FLYING MACHINE.—H. L. BERNARD, Mountain View, Cal. This invention combines the main features of an aeroplane and a helicopter, whereby certain advantages are attained in respect to starting and alighting, direction of flight, poising, maintenance of equilibrium, regulation of speed, and general safety. It is applicable to both monoplanes and biplanes.

Electrical Devices.

ELECTRIC MOTOR.—E. S. WETMORE, College Springs, Iowa. The motor devised by this inventor has a ratchet wheel and an electro-magnet and armature; pawls on the armature engage the ratchet teeth which are part of the circuit, and the relative movements of the parts make and break the circuit.

ELECTROLYTIC CELL.—A. TOMMASINI, 3418 Independence Ave., Kansas City, Mo. The object in view is to provide an arrangement of means for passing a current of electricity through a solution containing water in such a manner that the hydrogen bubbles created thereby will be directed to one point of discharge, and the oxygen bubbles will be directed to another point of discharge.

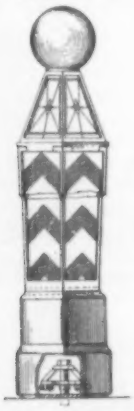
Of Interest to Farmers.

PORTABLE ORCHARD HEATER.—M. B. FITTS, Minneapolis, Kan. This invention generates steam and discharges the same along with hot air and heated products of combustion for any desired purpose; but it is particularly adapted for use as an orchard heater, that is to say, for preventing injury by low temperature to fruit and other trees, also to plants and vegetables.

BINDER TRUCK.—H. J. DRAGER, R. R., No. 1, Orlando, Okla. This truck is for attachment to a grain binder, for drawing the latter over the field or for transporting the binder from place to place. For this purpose the truck frame is arranged at its rear end for pivotal connection with the binder; and on the front end is pivoted a tongue and an evener, and in the rear of the front end is arranged a swiveled supporting wheel to support the truck frame.

Of General Interest.

ILLUMINATED ENAMELED METAL BARBER'S POLE.—F. DE PALMA, 236 Central Ave., Brooklyn, N. Y. This invention provides a structure the parts whereof are readily combined and quickly renewed; provides for securing the structure in position; provides means for preventing wear or waste incident to employment showing on the structure to impair the appearance thereof; and provides access to the interior of the pole. When the post or sign is employed as shown in the illustration as a sidewalk sign, the base above the sidewalk is raised and the same is lifted away from the corroding influence of water held on the sidewalk.



ILLUMINATED ENAMELED METAL BARBER'S POLE.

WOVEN FABRIC.—WILLIAM G. TRAUTVETTER, Paterson, N. J. The invention provides a fabric having interwoven bias or diagonal threads to reinforce the fabric and render it strong, durable and capable of withstanding strains in any direction. For this result the fabric is formed of interwoven ground warp threads, bias warp threads and weft threads, of which the bias warp threads extend diagonally across the fabric from one selvage to the other.

APPARATUS FOR DISTILLATION.—P. J. MATTINGLY, T. J. HINES, and J. J. BRENNAN, care of J. Seligman, Kenyon Bldg., Louisville, Ky. This invention has for an object to procure a more refined distillate by removing from the product all congeners which are of low grade and which are volatile only at higher temperatures, thereby producing a more refined product.

PROCESS OR METHOD OF MANUFACTURING ENVELOPS OR BAGS.—A. WASMUS, 16 Wolchonka, Moscow, Russia. The subject-matter of this invention is a process or method of manufacturing envelops or bags, particularly those having threads for opening them, which consists in the flaps being folded around a tightly tensioned thread serving as an abutment.

NON-REFILLABLE BOTTLE. E. J. HEIL, Carteret, N. J. The purpose here is to provide a non-refillable bottle with a member having an annular groove in which is disposed a resilient catch, the terminals of which extend into a recess in the neck of the bottle, to prevent the removal of the member after the member has been pushed into position.

WAGON GATE.—W. HOPPER, Jefferson, Iowa. This invention refers particularly to gates for wagons which are used for hauling and storing grain. Their bodies often have to be hoisted to deliver the load of grain carried thereby into bins and other compartments formed inside structures where grain is stored; and this invention comprises means for readily operating these wagon gates after the same have been lifted to permit grain to be discharged therefrom.

Hardware and Tools.

SWIVEL JOINT.—F. G. HAYES, 31 Ohio St., Sharon, Pa. This joint is for use on devices where it is desired to revolve the device or a portion thereof, the said revolving movement being substantially controlled by the operator. To obtain this, use is made of a body provided with a cap, and means on the body for revolving the same.

SUSPENDING DEVICE FOR STORM WINDOWS AND LIKE STRUCTURES.—J. M. HJERMSTAD, Red Wing, Minn. This invention is intended more particularly for use in connection with storm windows, screens, etc., such as are removably swung by their upper ends so as to admit of being fastened in vertical position in a window or door opening, or swung on their supporting means to a position inclining to the opening.

Heating and Lighting.

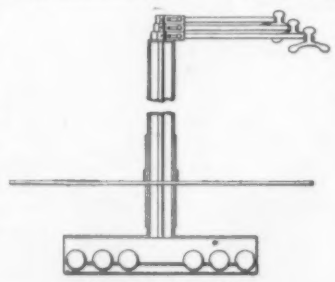
DRIER.—J. C. COGBURN, Marietta, Ga. Mr. Cogburn's invention relates in general to a drier, and more particularly to that class of driers known as "hot air driers." The invention supplies a continuous current of hot air directly to separate drying compartments; withdraws saturated air from each compartment by means of a fan attachment; and regulates the admission of unsaturated air to the device.

INCINERATOR FOR GARBAGE, ETC.—L. MATTHEWS, Paris, Tenn. A series of compartments is adopted to receive pans holding material to be incinerated and with a series of grates corresponding with the compartments, one or all of which may be used at a time, the arrangements being such that fumes from the material being incinerated and the products of combustion from the fire-boxes are directed into a common exit flue.

Machines and Mechanical Devices.

AUTOMATIC SHUT-OFF CONDUIT.—ISABELLA GILLEN, Rockaway Beach, New York, N. Y. This invention is an automatic shut-off for conduits, such as gas and water pipes, and is designed to operate a valve to close said pipe in case of fire, to prevent the contents of the pipe or conduit from escaping in case the pipes inside of the house or building communicating with the conduit should be broken or damaged.

MUSIC LEAF TURNER.—C. H. BARNETT, care of Rice & Abbott, Lincoln, Neb. Mr. Barnett's invention relates to music leaf turners, and has for its object to provide a simple, cheap and efficient device adapted to be used in connection with pianos, organs, etc., for readily and quickly turning either forward or backward the leaves of sheet music or music books. The entire device can be packed in a small space; indeed, the shelf may be entirely removed from the standard and the entire device put in a receptacle large enough simply to receive the base. The illustration pictures a front elevation of the device.



MUSIC LEAF TURNER.

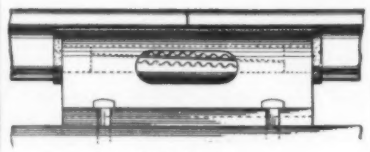
PADDLE MECHANISM FOR VESSELS.—W. H. WITTE, Charles St. Ave., Homewood, Baltimore, Md. This invention provides mechanism for propulsion in shallow streams; provides means for reversing, arresting and suspending the operation of the paddles of the mechanism to operate at various depths or to suspend the propulsive operation without stopping the machinery; and provides a means for preventing the inflow of water through the joints of the paddle box.

WATER LIFT.—B. F. STRANGE, 1.—R. F. D., Victor, Mont. This invention is especially adapted for elevating water to the uplands for irrigation and other useful purposes. It provides a mechanism for lifting water continuously from a lower level to a higher one especially adapted for use in irrigation. The flume or ditch may be of any desired construction, the size and length depending on the country in which the outfit is used. The operation of the car and the pusher may be continued for any desired length of time, and as many cars may be employed as can be taken care of, the operation affording a continuous supply of water to the upper level. The engraving shows a sectional side view of the water source and means of elevation to distribution points.

WATER LIFT FOR IRRIGATING.

Railways and Their Accessories.

RAIL JOINT.—C. W. YERBURY, 523 W. William St., Springfield, Ill. This invention relates generally to a rail and more particularly to a fish plate, adapted for use on steam, electric and elevated roads, or in mines or quarries, or any place where a construction is required to hold rails together for tractive service. The invention provides means for holding adjacent ends of meeting rails, arranged so that bolts or equivalent devices are not necessary. Further, a structure is provided which by reason of the arrangement of the parts is well adapted to hold the meeting ends of adjacent rails in position and insulated from the roadbed, thereby facilitating operation and maintenance of signal systems, which make use of the rails as parts of the circuit. A side view of the invention in operative position is herewith shown.



RAIL JOINT.

PNEUMATIC POWER PAINTING MACHINE.—F. DYKES and D. E. WELLS, Milliken, N. Y. This hand-guided, power-rotated brush delivers and spreads paint upon a prepared surface; it controls the supply of paint; and spreads the paint in the delivery thereof to the surface to avoid lumping or streaking of the finished product. Controlling devices for the brush manually control the quantity of paint and the spread thereof.

CONVERTER VALVE.—P. E. GANNON, P. O. Box 94, Jerome, Ariz. This invention relates to valves utilized in connection with the wind boxes of converters, particularly copper converters, which are adapted to permit of the insertion of a rod therethrough, such rod being extended through the tuyere for the purpose of preventing the latter from clogging while impurities are being blown out of the copper.

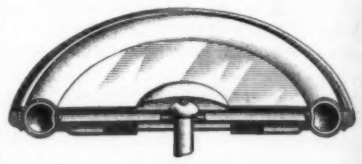
ADDING MACHINE.—J. W. WITSELL, 37-39 Haynes St., Charleston, S. C. In this instance the invention is an improvement in adding machines, and has for its object the provision of a simple and easily operated device of the character specified, of a size which permits it to be placed conveniently on the desk near the user, and which has few parts to get out of order.

WELL PACKING.—E. G. BOUTTE, St. Martinville, La., care of Bennett Oil Co., Opelousas, La. This invention is an improvement in packings, and has for its object the provision of a device especially adapted for deep wells, designed to be operated by a cable or the like, and adapted also to act as a seal for the well when required.

ATTACHMENT FOR SEWING MACHINES.—H. L. LAMB, 1409 Tremont St., Nashville, Tenn. The object here is to provide means adapted to be attached to the stabbing device of harness sewing machines, for channeling the leather in advance of the stitching mechanism, to provide a channel or groove for receiving and hiding the thread or stitch.

Pertaining to Vehicles.

PNEUMATIC WHEEL.—A. H. SMITH, Topton, Pa. The parts of this device being assembled and the annular cushion being inflated, the weight of the axle and parts carried thereby rests directly upon the inner surface of the pneumatic cushion and is thence transferred to the tire. The edge of the disk carried by the axle being loose relatively to the plates, is free to move relative to them and to the tire, the limit of movement being the degree of compression which the annular cushion can undergo. The cushion is not a tire in the true sense of the word, and as it is protected on all sides it can be made much thinner than tires are usually made. The engraving represents a cross section of one half of the wheel.



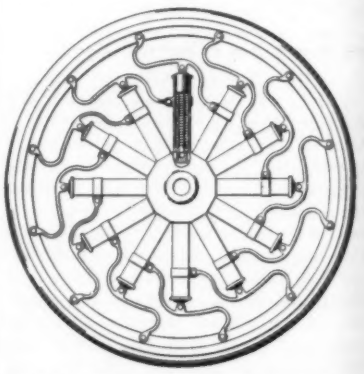
PNEUMATIC WHEEL.

ICE BREAKER.—J. L. OPP, Pinckneyville, Ill. This invention relates to devices for breaking ice from a cake, so as to serve a piece of any desired size and cause it to split on a substantially straight line. It is particularly adapted for embodiment in an attachment for ice wagons, but may be employed in connection with any suitable supporting frame at an ice plant, or the like.

VEHICLE WHEEL.—C. W. BARRETT, 153 Martin Ave., San Jose, Cal. The invention refers to wheels for use with automobiles and other purposes, and has reference more particularly to a wheel comprising a hub, a pneumatic cushion surrounding the hub, a felly, spokes connecting the cushion and the felly, and a solid cushion member within the pneumatic cushion.

VEHICLE WHEEL.—A. MCKILLOP, Alleghany, Cal. The inventor provides a resilient wheel which has the benefits of the ordinary pneumatic wheel, but in which the pneumatic member is not exposed to the wear of the ordinary pneumatic tire. The wheel has a series of pneumatic cushions disposed about the hub in such a manner as to take up shocks.

SPRING WHEEL.—A. W. DRUMMOND, Ap't. 56, Barker Block, Berkley, Cal. The rim is resiliently mounted with respect to spokes and hub, the object being to eliminate jarring and jolting of the vehicle on which the wheel is mounted when the last is in motion. The invention comprises a hub having a plurality of tubular spokes in which spring-actuated plungers are mounted, the plungers being pivotally connected at their outer ends each to a leaf spring connected at one end to the rim of the wheel and at the other end to the body of a spoke adjacent the spoke at which each plunger is mounted. A side elevation of the wheel is shown herewith partly in section.



SPRING WHEEL TO ELIMINATE JARRING.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12672) G. A. B. asks: If one pours hot water into a glass it often breaks, while if one puts a spoon in the glass first it seldom does break. Can you tell me why this is? What is the effect of the spoon in or on the glass that should save it? What is the scientific principle? A. The reason usually given why a glass does not break when hot water is poured into it, if a silver spoon be in the glass, is that the spoon serves as a conductor of the heat, and so the glass does not receive so severe a shock from the heat as it would otherwise. Silver is the best conductor of heat known, and therefore takes heat more quickly than any other material.

(12673) S. G. says: 1. Why is perpetual motion impossible? A. Perpetual motion is impossible because of the equality of cause and effect. The effect is never greater than its cause. There is no frictionless machine, and force is always required to overcome inertia in a machine whose parts have any weight. This being the case, some of the power imparted to a machine must be used in imparting motion to the machine itself, and in keeping it in motion. The rest of the power appears in useful work. This is always but a fraction of the total power imparted to the machine. No machine can, therefore, in any way generate enough power to turn itself and do useful work. It cannot even generate power enough to keep itself in motion continuously. 2. Does the law of gravity interfere with perpetual motion? A. The law of gravity is silent in regard to perpetual motion. It only specifies the manner in which matter attracts all other matter in the universe. It is simply a statement of a universal fact. 3. Has anyone reached the point of defying gravity? A. Anyone may defy gravity if he is strong enough. Every time you rise from a chair or climb a ladder you defy gravity. Aviation is a grand defiance of gravity. But if you mean that a man should rise without putting forth any exertion, and remain poised without support or effort, then our answer must be that no one has or ever will defy gravity, so long as attraction exists between the particles of matter. The constitution of the universe must be changed and become totally different from what it is at present for that to be done.

(12674) R. M. asks: Within the past few years we have had some very severe electrical storms, and my daughter's house has been struck twice by the lightning. We have been wondering why it should strike this particular house both times. It stands high and is 70 feet away from any other house. We do not think this the reason, because lightning strikes houses in valleys just the same. There is an attic over the entire house which is not plastered, and having a slate roof, the heat is intense. This attic is not used, as it can be reached only by a ladder. There are three windows in it, but of course it is not ventilated very often, and we have come to the conclusion that this hot, foul air attracted the lightning. We have broken a small pane of glass in each window, but this does not seem to help much. Have been thinking of putting a ventilator in one window. This would cause a current of air. If this is placed in the one window, would it be all right to have the small panes out of the other two? Would you advise placing shutters instead of the three windows? A. The matter of protection from lightning is a very perplexing one. It is certain that the old proverb, "Lightning never strikes twice in the same place," is not true. Some localities are more liable to be struck than others. The character of the soil seems to affect the liability to be struck. A recent writer makes the liability as follows: "If the liability for chalk formation is 1, then it is 2 for marl, 7 for clay, 9 for sand, 22 for loam." Some kinds of trees are more liable than others to be struck. In a study covering 45,000 acres in a German forest, it was found that oaks were struck 159 times; beeches, 21 times; pines, 20 times; firs, 59 times; birches, 4 times; larches, 7 times; and ashes, 5 times. The proportion of the different kinds of trees in the forest was: Beech, 70 per cent; oak, 11 per cent; pine, 13 per cent; fir, 16 per cent. These facts may assist you in judging whether the locality has anything to do with the frequency of the lightning strokes. As to the heat of the air in the attic, we have never heard of this as a cause of lightning striking, but it is best to ventilate the attic for its influence upon the health of the family in the dwelling. We should take the windows out on all the sides possible, and keep the rain out by a lattice blind during the hot weather, replacing the sash when cold weather comes on; but we should provide for ventilation all the year around. Some have thought that a current of hot air rising with the smoke from a chimney would act to determine the path of a lightning discharge. This may be true. In such a situation as you describe, we should have good lightning rods placed upon the house. To go into this matter in detail is quite beyond the limit of a letter, and we would suggest that you ask the assistance of the weather observer at the station in your city. The Bureau in Washington has published much valuable advice on the installing of lightning rods, and they will be able to place this at your disposal at a very moderate cost. Fortunately, there are relatively few fatalities to human beings from lightning as compared with the large number of lightning flashes.

NEW BOOKS, ETC.

PHYSIOGRAPHY FOR HIGH SCHOOLS. By Albert L. Arey, C.E., Frank L. Bryant, B.S., William W. Clendenin, M.S., M.A., and William T. Morrey, A.M. New York: D. C. Heath & Co., 1912. 8vo.; 450 pp.; illustrated. Price, $1.25.

Taking first the earth as a planet, and then dealing with its air, its sea, and its land, the collaborators in this text-book endeavor to impart to high school pupils a rounded knowledge of physiography. A great deal of care is evident in the selection and arrangement of material. That deemed advisable of omission from a first-year course is so indicated by being set in smaller type. Technical terms are italicized when first used, so that they may be the more readily mastered and defined by the student. The questions following each chapter require the use of the reasoning powers and the drawing of inferences, rather than a mere parrot-memory of the chapter material.

SANFORD'S MANUAL OF COLOR. By John Ithiel Sanford. New York: Mrs. J. I. Sanford, 150 Fifth Avenue. 8vo.; 33 pp.; illustrated. Price, $1.

Rightly holding that the harmony of color should be recognized as quite as important to the eye as harmony of sound is to the ear, Mr. Sanford gives us a primer of the laws governing color and combinations of color, a primer that might be used to advantage not by artists and colorists alone, but by all who desire to dress tastefully and to have their home surroundings harmonious and pleasing. It is true that the writer forces us to relinquish that magic word "vibgyor," so lavishly made use of by the school textbooks of fifteen or twenty years ago, for violet is classed as diluted purple and indigo is discarded as being a combination of black and blue and hence impossible of inclusion among the prismatic colors. But the destruction of a few cherished beliefs should not blind us to the merits of the little primer, which gives within thirty-three pages a wealth of sound instruction and demonstration. Two color charts serve to make clear the rules and definitions, the "hexagon color guide," showing in a particularly simple way the relation of primary, secondary, tertiary, and intermediate colors.

SOME CHEMICAL PROBLEMS OF TO-DAY. By Robert Kennedy Duncan. New York: Harper & Brothers, 1911. 254 pp.; illustrated.

A rather forbidding title, this, for a collection of most interesting essays. One would imagine that the book was intended for the specialist, did not the author's name give a clue to the nature of the work; for Prof. Robert Kennedy Duncan is well known as one of the most entertaining of writers of real science for non-technical readers. Two of the chapters in the present work take the reader to the very extremes of chemical exploration, from the investigation of particles so small that millions of them together would barely be visible to the naked eye, to the study of enormous incandescent masses, so distant that the largest of telescopes fails sensibly to magnify them above a geometric point of light.

From veriest childhood one has associated with the word "chemistry" a process of division by which eventually an individual molecule could be arrived at, a particle so small that it could not be further divided without surprising changes in its characteristic properties. The diameter was expressed by a decimal consisting mainly of a long string of zeros—whether a dozen or two dozen one could not quite remember. What was the use of burdening the mind with a theory? But those vague rows of ciphers now have a real meaning. The microscope, which at best could not detect an object smaller than one-seven thousandth of a millimeter in diameter, has been cast aside for the ultra-microscope, which enables one to see particles so infinitesimally small that if they are not actually molecules they certainly approach very closely to molecular dimensions. Better still, an apparatus has been devised for actually counting the myriads of atoms in a given quantity of helium. All of this is recounted in a most fascinating chapter on "The Question of the Atom."

From this point the reader is taken to the antipodes, where he finds the chemist collaborating with the astronomer in developing a new theory of the solar system and analyzing the constituents of a nebula countless millions of miles away, almost as if he had it in a test tube in his own laboratory.

Other frontier posts are visited in the chapters on the "Whitherward of Matter" and the "Chemical Interpretation of Life," and the reader is given a glimpse of two of the most fascinating phases of chemical research. The rest of the book pertains chiefly to problems of industrial chemistry: revolutionizing of the camphor industry; developments in bread-making, the relation between chemistry and manufacture in America, and the work of the industrial fellowships at the universities of Kansas and Pittsburgh.

The book as a whole is somewhat disconnected being largely made up of articles previously published in magazines, but each chapter is a complete story in itself, charmingly written in the author's familiar style.

MY THREE BIG FLIGHTS. By André Beaumont (Lieut. J. Conneau). McBridge, Nast & Co., New York: 156 pp.; illustrated.

Lieutenant J. Conneau, who assumed the name of Beaumont for aviation purposes, and won fame as a result of his remarkable performances in the now historic races, "Paris to Rome," the "European Circuit," and the "British Circuit," has written a most readable and entertaining book on his experiences. Lieutenant Conneau, unlike most aviators, is a man of scientific training and therefore admirably qualified to guide a machine through the air. Unquestionably his success is partly to be attributed to his skill in navigating. Lieutenant Conneau has written in a very light vein, and makes no pretense to giving much technical information. But even as it is, there are glimpses here and there of the difficulties that must be coped with in handling a monoplane.

INTERNAL COMBUSTION ENGINE MANUAL. By F. W. Sterling, Lieutenant U. S. Navy. Annapolis, Maryland: School of Marine Engineering, U. S. Naval Academy, 1911. 8vo.; 146 pp.; illustrated.

The manual is intended as a textbook for the use of midshipmen, but there is no reason why other students should not profit by the well-arranged data here offered. Fuel being the fundamental that controls design and operation, this subject is first presented. After considering fuel, ignition, cooling, and lubrication in their relation to the engine, these four operations are shown combined in some of the latest and most approved types of engine. The producer plant is given a chapter to itself. For so short a course, the subject has been treated in a very sensible and satisfactory manner.

STUDIES IN TERRESTRIAL MAGNETISM. By C. Chree, M.A., F.R.S. New York: The Macmillan Company, 1912. 8vo.; 201 pp. Price, $1.50 net.

The "Studies" present Prof. Chree's original researches in certain branches of terrestrial magnetism, and the work makes no claim to being a complete text-book of its subject, or a summary of existing knowledge. Among other papers of interest may be mentioned those on secular and non-cyclic changes, on diurnal inequalities, on Antarctic magnetic results, and on comparisons of Arctic and Antarctic disturbances. It is suggested that more rapid progress might be made if educational institutions, equipped with the necessary instruments, would co-operate in a general plan of systematic observations. The invention of a more accurate and efficient magnetograph, free from "drift," is greatly to be desired. The author believes that it may become possible to differentiate between various types of sunspots, and thus to attain to a perception of some definite relationship between sunspots and magnetic storms, toward the existence of which relationship it is at present advisable to maintain an open mind.

BASEBALLOGY. By Edmund Vance Cooke. Chicago: Forbes & Co., 1912. 16mo.; 88 pp. Price, 50 cents.

These rhymes of baseball deal most adequately with "Fan's taste, fan's talk, fan's dope, fan's everything." "Afflatus" is quite shamelessly rhymed with "tomatoes," "bucolic" with "baseball-ic," and under such dignified captions as "Metempsychosis" and "Evolution" appears some of the most atrocious slang ever heard about the diamond. The verve and vim of Edmund Vance Cooke's well-known style pervades every stanza, and fans—especially those sufficiently educated to appreciate references to Socrates, Titian, and Achilles—will find many a chuckle in this timely epic of the national game.

FALSE MODESTY. By E. B. Lowry, M.D. Chicago: Forbes & Co., 1912. 16mo.; 110 pp. Price, 50 cents.

"False Modesty" is a little volume of instruction by the author of "Truths" and "Confidences." Its appeal is particularly directed to parents, teachers, and physicians, and calls for the wider dissemination, in pure form, of the knowledge necessary to save the young from the various pitfalls which ignorance of sexual laws places beneath their feet. Some appalling facts are made known, and it is the writer's belief that the country is as debased, in proportion to its population, as the city. Instruction in motherhood is urged as a partial solution of the problem. In a final chapter on "Coming Educational Reform," facts all too little known alternate with clearly-phrased advice and instruction of prime importance to the men and women of to-morrow. The need of education in the laws of sex and in sexual hygiene is characterized as the greatest need of American civilization.

CUTTING IT OUT. By Samuel G. Blythe. Chicago: Forbes & Co., 1912. 16mo.; 60 pp. Price, 35 cents.

THE FUN OF GETTING THIN. By Samuel G. Blythe. Chicago: Forbes & Co., 1912. 16mo.; 68 pp. Price, 35 cents.

In "Cutting It Out," "it" refers to the use of intoxicants. As the cutting out of intoxicants was also a feature of "The Fun of Getting Thin," it would seem that Mr. Blythe might have informed the public in one volume, at one and the same time, how to refrain from liquor and how to reduce flesh. In each case from thirty to fifty pages are taken up in talking about the author's indifference as to whether anybody follows his advice or not, while the actual plans offered may be summarized in six words. However, had the little books been limited to essentials, we should have lost many pages of dry humor and sensible philosophy; then, too, it is probable that, written in this serio-comic vein, the little homilies will reach and convince good fellows who would never dream of attending a temperance lecture or reading a book on diet.

ALLGEMEINE VERERBUNGSLEHRE. Von Prof. Dr. Valentin Haecker, Zweite Vermehrte Auflage. Mit einem Titelbilde, 133 Figuren im Text und 4 farbigen Tafeln. XII, 405 S. gr. 8 vo. 1912 M–10–, in Leinenband Mll.–. Braunschweig: Verlag von Freidr. Vieweg & Sohn.

This book presents to the biologist, the physician, and the animal breeder results that have been obtained after twenty-five years' of investigation by students of heredity. The book is essentially practical in character; for, although the author seeks to trace back to the protoplasmic cell those inheritable differences which are the object of the eugenist's study, he devotes much space to the application of recent discoveries to humanity, to animal breeding, and to plant breeding. This is the second edition of the work, a fact which speaks eloquently for the favor with which it has met in Germany.

HANDBUCH FÜR HEER UND FLOTTE. Enzyklopädie der Kriegswissenschaften und verwandter Gebiete. Herausgegeben von Georg von Alten, Generalleutnant z. D. Unter Mitwirkung von mehr als 200 der bedeutendsten Fachautoritäten. Vollständig in 108 Lieferungen reichillustrierten Textes mit farbigen Beilagen, Karten, Plänen, Gefechtsskizzen usw. Leipzig: Richard Bong & Co., 1912.

Installments 41 to 44 of the Handbook for Army and Navy treat the subject from *Maximilian I.* to *Napoleon I.* Among the articles that should be particularly mentioned are those on the extra-European Colonial Wars (1500 to 1648), the wars of the Swedes, Prussians, and Poles for the possession of the Baltic provinces, and the Thirty Years' War. This last subject is discussed on the basis of entirely new investigations. Most interesting is Dr. Koser's essay on the Wars of Frederick the Great. General Count Schlieffen has discussed admirably the Napoleonic campaign of 1806-1807. There are twenty-five excellent war maps on which may be found every geographical name mentioned in these installments.

THE EVOLUTION OF ANIMAL INTELLIGENCE. By S. J. Holmes. New York: Henry Holt & Co., 1911. 296 pp.

In this book the reader will find summarized in a very popular and interesting way the main results of recent psychological and chemical study of animals. Loeb's work on tropisms is commented upon at considerable length, as it deserves to be, since it is a serious attempt to explain by chemical action alone movements hitherto rather vaguely ascribed to "instinct." On the psychology of animals the author has dwelt at considerable length, particularly on the work done more recently by such investigators as Thoundike. About one half of the book is devoted to an explanation of the more or less automatic movements of the lower organisms, and the other half to the subject of intelligence itself. An excellent feature of the book is the bibliography appended to each chapter.

HEREDITY IN RELATION TO EUGENICS. By Charles Benedict Davenport. New York: Henry Holt & Co., 1911. With 175 illustrations and diagrams, and complete bibliography and index. 8vo.; 298 pp. Price, $2.

Dr. Davenport may be regarded as the leading exponent in this country of the science of eugenics. He has done able work, as the head of the Cold Spring Harbor Station, in rousing the public conscience to the subject of human heredity. The discussion of such cases as that of the famous Jukes family in America and the Zero family in Switzerland has unquestionably served to drive home the consequences of a too promiscuous mating of the socially unfit. Although it is much too early to pass any legislation which would have for its object the purging of the bad blood now in human society, books such as this on human heredity perform the useful service of keeping the subject before the public and of indicating how far science has progressed toward the solution of a problem which is nothing more or less than the preservation of the human race.

Dr. Davenport is a strict Mendelian. Although like most eugenists he acknowledges the merit of the early work done by Galton, the biometric method evidently has no attraction for him. Because it deals with groups rather than with individuals, the biometric can hardly lead to a definite solution of the eugenic problem. The Mendelian method, to which this book is largely devoted, has the distinct advantage of enabling one to determine with certainty how certain tendencies are transmitted. It is known accurately how such physical and mental defects as *dementia praecox*, Huntington's chorea, deaf mutism, etc., are inherited. The effort which Dr. Davenport has made to carry the investigation further, for example, to the inheritance of specific diseases (rheumatism, skin diseases, and diseases of the blood), while not wholly successful, as he himself admits, nevertheless indicates the wonderful possibilities which lie dormant in the method, if we only could gather sufficient facts and accurate family histories.

EPICYCLIC TRAINS, which play an important part in toothed gearing, are ably described in Scientific American Supplement 1524. Price 10 cents. For sale by Munn & Co., Inc., and all newsdealers.

The New Serum Treatment of Bleeding and Hemorrhage

By Dr. Leonard Keene Hirshberg, A.B., M.A., M.D. (Johns Hopkins).

THAT the injection of fresh blood serum is a potent factor in controlling certain types of hemorrhage where there is a delay in the clotting of the blood, has been reported by a great number of scientific investigators.

The treatment of hemorrhage depends upon two factors: First, the use of drugs for their action on the blood vessels; secondly, agents used to promote the clotting of the blood itself. Many different kinds of drugs, whose value depends upon regulating the tension of the blood vessel have been used. Among them are the salts of calcium, strontium, magnesium, and solutions of gelatin.

In 1910, an investigation of the causes of twelve cases of hemophilia, which is a certain type of disease with continuous hemorrhages, were published. The coagulation or clotting of the blood was long delayed, in all of these cases and in those patients who showed the most marked symptoms, clotting or coagulation required an hour or more.

Two forms of hemophilia were discovered, the accidental or transitory, and the congenital variety which appeared at birth. In the former the blood was thin and flowed rapidly through a needle inserted into a vein. In the latter, the blood was found to be sticky and it flowed slowly, very much like molasses. Experiments with blood were carried on, showing that if three drops of animal blood serum were added to three cubic centimeters of blood in either class of patients, the coagulation of blood took place promptly and hemorrhages ceased. They also discovered that the same effect could be produced by internal injections of the blood serum. The serum of a man, rabbit, horse, or ox was all found to effect a quick clotting of blood, previously conducive to hemorrhage. The value of this finding is appreciated, when it is realized that bleeders or "hæmophilics" are as common as club feet.

The serum was injected into a patient before the extraction of a tooth, and during an operation upon an abscess, and it successfully prevented every vestige of hemorrhage. As one doctor says: "Fresh serum is an effective remedy for the arrest of hemorrhage in all cases of blood disease. It is more effective than any previously discovered method to prevent general bleeding."

In applying the use of the serum, large doses must be employed, and that while any serum may be used, that of the ox or goat should, if possible, be avoided, since it has the power to produce toxic symptoms of a serious nature. The use of injections of animal blood, to prevent hemorrhage is permitted only in cases of real bleeders disease called "hemophilia." Many failures were reported due to attempts to apply blood serum to other diseases.

An eminent scientist at work on this problem says that an injection of fresh serum is the most efficient means we have for the treatment of hemophilia, but if it is not at hand, regular antitoxic serum, whether diphtheria or lockjaw antitoxins, may be employed, and answers just as well.

There is a case of a boy of fourteen years who always had hemorrhages from the nose and gums which failed to respond to the treatment of injections of gelatin solution, but which stopped when injections of diphtheria antitoxin were applied. There is another case of a newly-born infant who had hemorrhages from the mouth and nose. The infant was treated by applying sponges dipped in horse serum, which rapidly controlled the bleeding.

Here is a typical case of hemophilia. A child, who was in a very poor condition as the result of a steady loss of blood following the extraction of a molar tooth, was treated by the application of astringent medicines, but they proved absolutely useless, so it was decided to try the administration of serum. Normal horse serum was injected, and after a few minutes the oozing blood became less and less and the bleeding stopped. There was a recurrence and relapse, however, and another injection of horse serum was given the following day. At once the hemorrhage ceased and did not reappear any more.

A striking report of the use of serum in treatment of hemophilia is afforded by a New York pathologist. He injected normal human serum in the treatment of nine babies. He believes that all of these babies would have died under any other treatment.

The following conclusions have been obtained by different workers:

1. The coagulation period in hemophilic subjects or "bleeders" is greatly shortened by the injection of fresh serum.

2. The local application of fresh serum in wounds, in patients in whom there is a delayed coagulation of the blood, acts as a preventive of hemorrhage.

3. The serum of any living animal species is efficient in producing this phenomenon of clotting.

4. The sera of the ox and dog should be avoided if possible, because of the toxic symptoms frequently attending their use.

5. Regular tetanus and diphtheria antitoxic sera are less satisfactory than freshly drawn material, but do very well in an emergency.

The difference between antitoxic and fresh sera may be due either to age or to the presence of the preservative drugs, which the former always contain. The reports that antitoxic sera have been effective in some cases and disappointing in others is due to the fact that age or drugs act as a retardant to clotting. The inactivity of the sera probably depends upon the changes which they undergo with age.

The belief that the action of animal or human serum in increasing the coagulation of blood in hemophilic subjects depends upon the substitution of an active clotting agent is, therefore, based upon the following facts:

The rapidity and completeness of coagulation is directly proportional to the amount of this complicated clotting agent found in the serum that is introduced. This agent is called "thrombin," and is about the same as the pepsin in the stomach.

Experience shows that relatively large amounts of serum must be employed to produce definite results. That is to say, to stop bleeding in anyone, it is essential that large quantities of new blood serum be introduced into the veins of the one who is suffering the hemorrhage. It is worse than useless to give a little serum: a great deal or none at all must be given.

To Dr. Alexis Carrell, Prof. William H. Howell, and Dr. Crile, all young American scientists, the public are indebted for discoveries that have lead up to this great new method of life-saving. With antiseptics, antitoxins, anæsthetics, aeroplanes, spectrum analysis, radium, X-ray, wireless telegraphy, telephones, the Panama Canal, and synthetic chemistry, the serum treatment of hemorrhage and bleeding, will be soon placed among the modern wonders of the world.

Can the Baser Metals Be Changed to Gold?

THE newer scientific contributions from the physical, chemical, and electrical laboratories, work from discovered and confirmed facts to widely applied theories. This is in marked contrast to the science of the schoolmen and the ancients, who ponder deeply in a high attic, evolve some kind of a theory, and then discover only such facts as conform to their pet theory.

This difference is much more marked than the man in the street is willing to admit. It is a contrast that many boast-

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PROPOSALS

STATE OF NEW YORK, HEALTH OFFICER'S DEPARTMENT, Rosebank, N. Y.

NOTICE TO CONTRACTORS.—Sealed proposals for constructing a Pier at the Quarantine Station, Rosebank, Staten Island, will be received by Doctor Joseph J. O'Connell, Health Officer, Port of New York, Rosebank, Staten Island, N. Y., until twelve o'clock, noon, on August 28th, 1912, when they will be opened and read publicly. Proposals should be accompanied by certified check in the sum of 5 per cent of the amount of bid and the contractor, to whom the award is made will be required to furnish surety company bond in the sum of 50 per cent of the amount of the contract within ten days after the official notice of award of contract, and in accordance with the terms of the specifications. The right is reserved to reject any or all bids. Plans and specifications may be consulted and blank forms of proposal obtained at the office of the Health Officer, of the Port of New York, Rosebank, Staten Island, and at the office of the State Engineer and Surveyor, State Hall, Albany, N. Y. Complete sets of plans and specifications will be furnished prospective bidders upon reasonable notice to and in discretion of the State Engineer and Surveyor, State House, Albany, N. Y. (Signed) JOSEPH J. O'CONNELL, Health Officer, Port of New York. Dated: Rosebank, Staten Island, August 12th, 1912.

INQUIRY COLUMN

READ THIS COLUMN CAREFULLY. You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. *In every case it is necessary to give the number of the inquiry.* Where manufacturers do not respond promptly the inquiry *may* be repeated.
MUNN & CO., INC.

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ful "self-made" men do not see. The investigations of radio-activity and electrons, have proved beyond cavil that the elements are not immutable. They are essentially all alike at bottom, and are made by an evolutionary process.

It is known to every high school student that the element radium, spontaneously disintegrates into two other elements; one a heavy, inactive gas called niton, and a lighter gas called helium. In turn, after niton has emanated from radium, it changes into helium and a solid element, until recently called radium A. Radium A also undergoes disintegration into other elements, and so on *ad infinitum*. Each one of these breaking down experiments sets free enormous quantities of energy; enough, in fact, to make electricity for a large city. It has been carefully calculated by Sir William Ramsay and his co-workers that the decomposition of one cubic centimeter—about ¼a thimbleful—of niton, is accompanied by the evolution of some four million times as much heat as is obtained by burning an equal amount of gas.

It is thus clearly apparent that as each element and its atoms disintegrate, they unlock and liberate a reservoir of potential energy so immense that the finite mind of man cannot grasp it. Once this vast effort of nature is realized, it will begin to be faintly understood, how much power will be necessary to generate the excessively high potential requisite, to change or transmute one metal element into another; base tin into virgin gold, as the alchemists attempted. The only energy of this sort available is that given out with the natural breaking up of niton and the other radio-active elements; and even then because of the long periods required, the slowness of the change, the transmutation even if possible, only infinitesimally small particles of elements would ever be transmuted.

Sir William Ramsay recently performed certain experiments in this direction on distilled water and niton. Mr. Cameron assisted him in this work. Distilled water, upon which a very small amount of niton gas was allowed to act, was placed in a silica glass tube. Then the gases which resulted were removed, and examined with a spectroscope. Hydrogen, oxygen, helium, neon, and niton were found. They concluded from these experiments that the transformation of niton into neon in the presence of distilled water as indisputably proved, and, if a transmutation be defined as a transformation brought about at will, by change of conditions, "then this is the first case of transmutation of which conclusive evidence is put forward," Dr. Ramsay writes.

Sir William Ramsay and Mr. Cameron no longer maintain in the face of Madame Curie's disproof, that lithium can be transmuted from copper. The work of Sir William Ramsay with Mr. Usher on the action of niton upon solutions of lead, thorium, titanium and silicon, where carbon was always previously excluded, showed the presence of carbon dioxide every time. Chlorate of bismuth and zirconium solutions, showed carbonic acid gas also when acted on by niton.

But in no case so far discovered, was an element obtained by such transformations that were heavier than the elements from which they came. No experiment has yet been successfully carried out by Sir William Ramsay or by any other physicist, in which an element became changed into one of higher atomic weight. Even criticism of such transmutations as have been obtained, were made. Rutherford held that the neon and argon found, might have come from the glass or leakage, but the quantities reported certainly disprove any such possibility.

Loath as we have been to give a place in modern chemistry to the doctrine of transmutation of elements, little as we care to seriously consider attic theories, dogmas dear to the hearts of the advocates, near-new philosophy, or chemical divining rods, none of us can deny these established, laboratory facts, repeatedly confirmed by unbiased experimenters.

Hence, the volatile imaginings of that vapory crew of pseudo-chemists of the

AVIATION

¶ Two topics are of paramount importance just now in aviation. The one is the possibilities of the hydro-aeroplane—the flying boat in popular parlance—and the other is the flying machine as a military weapon.

¶ In the forthcoming mid-month September issue of the Scientific American, which will issue on September 14, these two subjects will be authoritatively discussed.

¶ Mr. Carl Dienstbach writes on the hydro-aeroplane. He points out how important is the development of the flying boat, because at last we have a vehicle of the air which is safe and which means much for the advancement of flying as a sport.

¶ Major Bannerman Phillips of the British Army, a noted European authority on the military aspects of aviation, will write on bomb-dropping. He will show how much or how little is to be expected by dropping high explosives on an enemy's force from a height of half a mile, basing his comments on the achievements of aerial grenadiers in the Tripolitan campaign and on the results of the bomb-dropping contest held in France.

¶ Dr. Alfred Zahm, America's leading authority on aero-mechanics, will show in a popularly worded article what has been the development of laboratory work since the day of Langley. If the flying machine is to become a really practical vehicle of the air it must be developed by the same methods that have given us giant bridges, huge dynamos, highly ramified telephone systems. That is why Dr. Zahm's article, dealing as it does with investigations made by engineers and physicists, is of immense practical value.

¶ There will also be the usual Scientific American features—the short pithy articles on current scientific events, with many bright illustrations of the latest inventions and scientific apparatus, the latest news for inventors.

¶ A Stirring Colored Cover by William Harnden Foster.

¶ Price 15 cents on all news stands.

Middle Ages, although founded upon vain dreams and their illogical yearning for a philosopher's stone and an elixir of life, the modern physicists now stand sponsors to the ghostly nothings of mediæval alchemy.

The Aeroplane in the Military Maneuvers

(Concluded from page 156.)

above a height of 2,000 feet. If the barograph showed that they had dipped below this level they would be counted out, having been theoretically shot. German regulations place the safety zone above 2,800 feet, and French regulations above 3,000 feet. Considering the fact that the men had to use both hands for the control of their machines, and, therefore, could not employ field glasses to study the country beneath them, the reports they turned in were marvelous in detail and accuracy. Lieut. Foulois, for instance, in his reconnaissance of August 13th, left camp at 3.58 A. M. and returned to camp at 10.28 A. M. The report he brought back covered two typewritten pages, and gave the location of thirteen different military bodies. All the time he was making tests with his aeroplane wireless set. No actual messages were sent, but various letter signals were transmitted, for the purpose of attuning the instrument. Lieut. Milling also brought back a very complete report, which was even more detailed than that of Lieut. Foulois, for the reason that he was not handicapped by attention to a wireless telegraph instrument. With his high speed machine he made the circuit in a little over an hour and brought back detailed information that would have taken half a day for an entire brigade of mounted scouts to have collected. As yet the relative accuracy of the report obtained by mounted scouts and those obtained by aeroplane scouts have not been made public. However, the chief umpire knowing the exact position of every detachment was able at once to confirm the accuracy of the aeroplane reports.

The officers have expressed themselves as highly pleased with the work of the aviation squadron. It must be borne in mind that the country over which these operations have been conducted is the most difficult flying country imaginable. There is no level ground anywhere. It is so cut up with valleys and gorges that the air fairly boils with unexpected gusts of wind.

Although Mr. Haven is an accomplished and daring aviator, his work so far, as a scout has been very disappointing. While the other scouts have brought back two-page typewritten reports, he has been able to discover practically nothing of value. It has been urged that the United States Army does not need to go to the expense of establishing an aviation squadron for the reason that there are so many experienced aviators in this country who could be hired in time of war to do the scouting for the army, and if they were unable to report any information themselves, they could at least carry a passenger with them. The present maneuvers show that the carrying of passengers is by no means feasible under all conditions, and unless the aviator is able to make a detailed report, the army is likely to suffer from lack of important information.

While the aviation squadron has done splendid work under the peculiar conditions encountered, nevertheless the fact has been clearly demonstrated that what the army requires is a well trained corps of aviator scouts with machines not necessarily of high speed, but certainly of large carrying capacity, which will be capable of rising from the ground under the most adverse conditions. It is quite essential that a machine carry a passenger because it is impossible for a man to pilot a machine and keep track of all that is passing beneath him, trusting to his memory largely with only an occasional opportunity to reach over and jot down a few words of memorandum.

If this branch of the service can be fully developed, it will no doubt result in great economy, for it will make it unneces-

sary to employ mounted scouts, thus leaving the cavalry free for fighting purposes only. Of course in these maneuvers the aeroplanes have had no enemy in the air to contend with. During the first half of the maneuvers, that is, in the instructional period, the aviation squadron was neutral. After that the machines were divided between the two armies. They were perfectly safe from attack as long as they kept above the danger zone, but in time of war no doubt they would have to contend with aerial sharpshooters.

The work of the wireless set on board Lieut. Foulois's machine was purely experimental, and nothing much was done. The instruments he used were selected and installed by himself on the machine. A small generator capable of developing 250 watts was driven by friction gearing from the flywheel of the engine. He used the wire bracing of the aeroplane for a counterpoise, and for his antenna he employed a suspended copper wire 300 feet long. This he paid off from the machine gradually after he had reached a sufficient elevation. His sending key was attached to one of the operating levers. The only one available was that on the left hand side, and it was necessary for him to send his signals by operating the key with his left thumb. This was exceedingly awkward, and the signals he sent were certainly not of the best. Nevertheless, they were clearly picked up by the wireless station at headquarters, even when the aeroplane was over twelve miles away. When landing, Lieut. Foulois clipped the wire before it had come within reach of trees or other obstruction on the land. The release of the antenna was effected very accurately, and it always dropped within a prescribed area, so that it was readily recovered.

Antagonistic Body Juices

THE substance produced by the "suprarenal capsules," small bodies lying just above the kidneys, plays an important part in the workings of the higher organisms, since death quickly follows the removal of these bodies. At the same time, the exact function of the substance is not known. If a small quantity of the adrenalin, or extract from one of these capsules is injected into the blood, there is a quick rise in the blood-pressure. This is brought about by the contraction of the muscles of the smaller arteries. The effect lasts but a few minutes, however, and at the end of that time it is quite impossible to discover a trace of the adrenalin in any part of the blood. What becomes of the adrenalin in that short time is a complete mystery.

Many poisons and other foreign substances are destroyed or neutralized directly by the blood, but that is not the case with adrenalin. If a small quantity of the substance is mixed with blood and the mixture is allowed to stand, the adrenalin may still be discovered the next day. Neither is it destroyed by any sera.

Within a very short time, however, Dr. S. J. Meltzer of the Rockefeller Institute has discovered that there is a body fluid capable of destroying adrenalin. Dr. Meltzer had an opportunity to obtain quantities of spinal fluid from a number of patients suffering from various diseases. In all cases the adrenalin was destroyed by the spinal fluid within an hour, if kept at the temperature of the blood. If the mixture of the two fluids was kept in an ice-box, however, the adrenalin was just as active at the end of a long time as it was when first prepared. One part of the adrenalin was mixed with twenty parts of spinal fluid, and one half cubic centimeter was used as a test, the effect of the mixture upon blood-pressure in a frog being an indication of the activity of the adrenalin. If the mixture is kept warm, even four times the normal dose produces no effect at the end of an hour.

In some diseases the spinal fluid is much more active as a destroyer of the adrenalin than in others. Thus the spinal fluid from a patient suffering from infantile paralysis is quicker in its action than the spinal fluid from one having tubercular meningitis. This fact may turn out to be of great practical importance, in the opinion of experts.